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The Application of Standards to Production Management[1]

by

Myron H. Clark, *Vice-President*
Reading Iron Company[2]

How standards are used by the Reading Iron Company to solve many manufacturing problems; the development of the various types of standards

This paper is not intended as a presentation of the arguments for, or the advantages of, standards as an aid to production, but is presented with the assumption that they are accepted in principle by a majority of this audience. Neither is it an attempt to present a new method or an ideal procedure for attacking the problem of the development and application of standards.

It is intended simply to show the line of approach being used by one company in the manufacture of puddled wrought iron products.

This paper is not even a presentation of a finished case, as the task has really only been started.

It represents, then, the application of an accepted principle to an old but complicated industry in which little has been done on standardization other than on the finished product. Tradition and opinion have each played a part, resulting in undirected growth or drift rather than organized effort.

The work is only in process of formation and the author is glad to present this paper as a possible check on his own thinking. He also hopes it may arouse discussions and bring out some thoughts that will be helpful to others as well as himself.

Webster defines a standard as that which is established by authority, custom, or general consent as a model or example. Modern industrial management employs the word in a more strictly limited sense: That which is established by custom or general consent does not become a standard until it has been subjected to investigation and experiment, reduced to writing and definitely and formally approved by proper authority. It is this latter sort of standard with which we are dealing.

In the development and application of standards, we have found it advisable to sell our program to the supervisory force, and also to employees to some extent. To do this, we emphasize that standardization is not new and even cite certain historical facts.

While standardization in the more limited sense is comparatively recent, in the more general sense it is as old as the human race. Primitive man had his stone axe which closely resembled those carried by other members of his tribe. The individual variations were due rather to inability to produce exact duplicates than to direct intent. Standards such as these were based only on custom and general consent, or were perhaps due merely to lack of initiative.

The Egyptians carried them one step farther in that the artist or physician whose method departed from standard was subject to heavy penalties. Here we have standards established by authority in addition to custom and general consent, but not based on careful experiment.

The Chinese had standards which became "frozen" centuries ago. Like the Egyptians they suffered, not because they adopted standards in the first place, but because they did not improve their standards to meet changed conditions. The rest of the world outstripped them.

In our work we endeavor to profit from the lessons of history and to keep before us the fact that standards are not, and cannot be, permanent. They represent a progressive state of improvement rather than an ultimate end or ideal. Standards naturally lead to better standards.

In developing standards, as far as possible, we are building from the bottom, step by step, rather than accepting past or present practice, and then trying to cut out unnecessary steps.

We believe that at the start too much emphasis should not be put on accuracy, as the standard will probably not be perfect anyway. Imperfect as it may be, however, it will be better than no standard at all.

Since the object of business is net profit, we started on a study of costs. We found wide fluctuations due to many causes, some of them not definitely known. In order to control

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[2] Reading, Pa.

costs it was first necessary to control our materials and methods. A brief study of the situation indicated that there was a definite need for the development of standards and their strict application. Instructions, practice, specifications, etc., had not been reduced to writing. In other words, while the quality of the product had been carefully safeguarded, little had been done to standardize methods or rates of production in order to control the cost of the product.

The process

For the benefit of those who may not be familiar with the process it may be well to state now that the manufacture of puddled wrought iron is quite different from the manufacture of steel.

Pig iron is produced from ore in blast furnaces in the usual manner, according to specifications to suit our particular requirements. Pig iron, however, is a brittle, non-malleable material running about 93 per cent metallic iron.

Puddled wrought iron is produced from pig iron by a method called puddling which removes impurities, such as silicon, phosphorus, sulphur, carbon, and manganese, and results in a tough, fibrous material very different in its characteristics from the brittle, non-malleable pig iron.

An essential feature of the process is the relatively low temperature at which the oxidation is carried out. At no time does it exceed 2400 F or about four to six hundred degrees less than the steel processes. Because of this low temperature the iron is in a pasty condition during most of the process and physical agitation is necessary in order to secure a uniform degree of refinement throughout the batch. As the pasty mass of iron is immersed in a bath of liquid slag a certain amount of the slag is incorporated with the iron and remains through the subsequent rolling and heating operations.

The iron is drawn from the puddling furnace in the form of a ball, and after a preliminary "squeezing" is passed through a train of rolls reducing it to a "muck bar" about five-eighths of an inch thick by three to six inches wide.

The muck bars are later cut up into suitable lengths, piled (in order to get elongation of fibers and reduction in cross section), reheated and, by a second rolling, converted into skelp, plate, or bars. Skelp is the plate from which pipe is made by bending and welding. During the rolling operation, the incorporated slag layers are extended, imparting to the resulting product the fibrous structure and the desirable characteristics of puddled wrought iron.

Among these characteristics are resistance to shock, fatigue, corrosion (particularly atmospheric corrosion), ability to hold protective coatings, and the quality of acting under rupturing strain much as a rope does, giving way, fiber by fiber, gradually and with warning.

As already mentioned, this industry is very old, and its practices, based on custom or tradition, go back for many years. From its beginning, the manufacture of puddled wrought iron, in many of its phases at least, has been a craft rather than a science. To a large extent, responsibility for quality was left to the skill of the workman, and the personal equation was prominent in many of the processes. Until recently, management had rarely attempted to standardize conditions or reduce them to writing. There is a belief in many quarters today that conditions cannot be standardized. However, this belief seems to have been the common experience of all industries wherever the development and application of standards have been attempted.

Puddled wrought iron is on the market today because of its inherent characteristics resulting in unusual resistance to corrosion, fatigue, shock, etc. Therefore, quality control is of first importance.

The quality of wrought iron is dependent principally on the degree of refinement, slag content, and distribution. The mechanical working put upon it and the temperatures to which it has been subjected during the process (400 to 600 degrees below the steel process) have as much to do with the quality as its chemical composition.

For these reasons, failure to control some detail almost anywhere in the process may result in difficulties which may not show up until several more operations have been performed and, when detected, may be difficult to trace back to the original cause.

Some of the factors requiring close control are: (1) raw materials; (2) process at blast furnace; (3) processes at puddle mills; (4) processes at heating furnaces and rolling mills (skelp mill); (5) processes at pipe furnaces; (6) finishing processes.

1. Raw materials—Raw materials are controlled by standard specifications in the usual manner and offer no special problem.

2. Process at the blast furnace—The proportions of the charge, the amount, pressure, and temperature of the air blast must be controlled.

3. Processes at the puddle mills—The weight and proportions of the charge and the nature of the furnace lining all have an effect on the resulting quality of iron.

The temperature of the furnace must be controlled. Too high a temperature will result in an inferior quality of iron.

The atmosphere must be controlled. At different stages in the process alternate oxidizing and reducing atmospheres are required.

The method and amount of working while in the furnace and the timing of the various operations are important.

After leaving the furnace the amount of work or percentage of reduction in cross-sectional area in rolling into muck bar has a decided effect on the quality of the finished product.

4. Processes at heating furnaces and rolling mills (skelp mill)—In the furnaces, temperature, time, atmosphere, and materials used in the furnace bottoms must be controlled.

Iron must be brought to the exact welding temperature without overheating and delivered to the rolls at the right temperature. If it is too cold it will not weld; if too hot, quality will be impaired.

Here again, as in the rolling of muck bar, the percentage of reduction in rolling is important. Not only the total amount of reduction but the amount per pass and the particular manner in which it is effected are important.

The product of this rolling is called skelp, which is a flat bar or plate of correct thickness and width to form the required size of pipe.

5. Processes at pipe furnaces—At the pipe furnaces the same elements as in the heating furnaces—time, temperature, atmosphere, and nature of bottoms—must be controlled.

In forming pipe from the skelp it is necessary to have the iron at the correct temperature at the moment of welding. The edges must be clean and brought together with sufficient pressure to form a sound weld.

The pipe must comply with strict specifications as to diameter, roundness, weight, and thickness of wall.

6. Finishing processes—In threading, the precautions that are necessary for accurate threads of any type must be taken, but as pipe threads are tapered there is one additional element which is not encountered in bolt threads.

If the pipe is to be galvanized, accurate control of the pickling process is necessary. Pipe must be thoroughly clean and free from scale.

The spelter must be of correct quality and the bath must be at proper temperature when the pipe is dipped. The pipe must remain in the bath long enough to be raised to the temperature of the spelter or it will not take the coating.

All pipe regardless of nature of finish is given a hydrostatic test, the pressure depending upon the size and type of pipe.

Organizing for standards

With the foregoing points, among others, for which standards might be set, it is obvious that they cannot all be undertaken at once, nor can the problems be handled by any single group. We are proceeding as follows: (1) to determine where and what to standardize; (2) to develop standards and reduce them to writing; (3) to apply and maintain standards.

Various agencies have been found helpful in indicating where standards should be set: market analysis, costs, yields, loss segregation reports by causes, complaints, suggestions, promptness of shipment of orders, accident reports.

In determining points at which standardization should be undertaken we are making constant use of information furnished by the Sales Research Department. Through this department we are kept informed as to standards of finished product required by the trade and these are incorporated into our manufacturing standards as rapidly as it is possible for us to do so.

When the need for a standard is established the responsibility for its development rests either with the Industrial Engineering Department or with the Research Department, depending on the nature of the problem.

The development of standards requiring preliminary laboratory research is assigned to the Research Department.

The development of standards which do not require laboratory research is turned over to the Industrial Engineering Department at once. Others may be referred to them after laboratory research has been completed by the Research Department.

The Industrial Engineering Department has responsibility for developing standards and reducing them to writing in standard form. Among the subjects covered are the following: (1) written standard instructions for responsibility heads; (2) standard specifications for raw materials and supplies; (3) specifications for finished products; (4) standard methods and processes; (5) standard equipment, tools, etc.; (6) standard crews; (7) standard rates of production; (8) standard yields; (9) standards of wage payment—class wages; (10) standards for maintenance; (11) standard costs; (12) standardization of forms, reports, etc.; (13) standard methods of handling and storing raw materials and finished products.

1. Written standard instructions for responsibility heads—We are developing written standard practice instructions to define the general responsibilities of each division of our organization together with the relation of one to another.

After the responsibilities of major divisions are clearly defined, we intend to extend these instructions to cover the minor sections, so that eventually each member of the organization will be fully acquainted in writing with his duties and relations to other members of the organization.

2. *Standard specifications for raw materials and supplies*—In order to control our manufacturing process and the quality of our finished product, it is necessary to set up definite specifications for our raw materials. These specifications are being so written that our testing facilities can determine whether or not material offered us meets the specifications we have set up.

3. *Specifications for finished products*—As a guide for our inspection department, we are developing standard specifications for the quality of our finished products. These specifications when written are also useful as a guide in standardizing our methods, raw materials, and rates of production, and consequently have an effect on standard costs.

4. *Standard methods and processes*—As each of our manufacturing methods is investigated it is reduced to writing to record the present approved practice for producing a finished product of standard quality.

As an example, in setting standards on pipe furnaces it is necessary to cover furnace design, preparation of material, furnace time, fuels, temperature, drawing speeds, furnace bottom, forming tools. As fast as better methods are developed the standards will be revised to conform.

5. *Standard equipment and tools*—As a result of standardization of equipment and tools we are decreasing our inventories of numerous kinds of spare parts.

Some of the items with which we are particularly concerned at the present time are electric motors and accessories, packings, taps, dies, and chasers.

6. *Standard crews—labor standards*—Through our studies incident to the standardization of methods we are gathering data which are very valuable in determining standard crews for the various operations.

These are being expanded from individual operations to complete departments and eventually will embrace all plants.

7. *Standard rates of production*—Standard rates of production follow naturally from the establishment of standard methods, equipment, tools, and crews.

We are building up standard rates of production for each operation. These may be expressed in units per man hour or per machine hour or in tons per day, per hour, or per turn, etc.

These standards are indispensable in planning and scheduling, and their establishment prepares the ground for a rational approach to a wage-incentive plan.

8. *Standard yields*—Standard yields are closely tied up with standard production. As we use the term it is the ratio of output to input or the percentage of finished product to the amount of material started in the process.

These yields are valuable in planning and scheduling, in the ordering of raw materials and, along with standard production rates, will be useful later in approaching wage incentives.

9. *Standards of wage payment—class wages*—We are giving special study to the matter of wage rates, with the object of adjusting rates of pay so that, as nearly as possible, work will be paid for in proportion to its difficulty, skill required, and company value.

In the attempt to standardize wage rates, we found it necessary first to standardize the jobs, or at least their names, so that we should not have similar jobs with different names, or the same name for different jobs in different locations.

We are developing fair class-wage rates for each job, based on job evaluation.

10. *Maintenance standards*—Major repairs are carefully planned and scheduled in advance and estimates of cost are prepared. This, of course, cannot be carried out in emergencies, but such cases fortunately are exceptional.

Before starting on extensive repairs, such as the rebuilding of a pipe furnace, we carefully consider whether we should rebuild according to the existing design, modify the design, or replace with entirely new equipment.

By periodic inspection and upkeep we try to keep major repair jobs to a minimum.

We are working toward a plan by which we hope to establish a standard ratio of maintenance-labor hours to direct-labor hours on any major piece of equipment. Maintenance standards are, of course, valuable in establishing standard costs and in dependable production scheduling.

11. *Standard costs*—We have assigned responsibility for the development of standards to the Industrial Engineering Department rather than the Accounting Department.

In building up standard costs we are making good use of our standards of materials, production, labor, yields, wage rates, maintenance, etc.

With us, volume has such an influence on various operations that we have found it advisable to develop standards based on different volumes.

12. *Elimination, standardization, and simplification of forms, reports, etc.*—In order to handle effectively the detailed information necessary in our various activities, including the work of developing standards, we have found it advisable to make a complete survey of our printed forms. We are reducing the

number of forms in use, and many of the remainder are being revised and simplified so that they will be more usable.

13. Standard methods of handling and storing raw materials and finished products—In this work the Industrial Engineering Department ties in closely with the Planning Department. While the latter determines the maximum and minimum inventories to be carried, the Industrial Engineering Department has the responsibility of developing methods of handling and storing, and the amount and location of storage space necessary.

Preliminary study shows that with some rearrangement, the entire responsibility for storage can be placed on the Shipping Department, permitting operating foremen to concentrate on the operation of their production departments.

Planning department

This department has the responsibility for controlling and scheduling production. All orders are first routed to, and all shipping promises are made by, this department. It issues all manufacturing orders and has responsibility for the control of inventories. It is responsible for determining maximum and minimum inventories, which are based on information received from the Sales Research Department.

By using the standards for rates of production and yields established by the Industrial Engineering Department it is able to schedule and control production.

This department is also responsible for the ordering of raw material and supplies, and scheduling the time of arrival.

The application of standards

After standards are developed responsibility for their application is definitely assigned.

The operating departments are responsible for producing finished goods of standard quality by standard methods and with the standard amounts of labor, fuel, power, etc.

The Manufacturing Standards Department, which in some plants might be called the metallurgical department, passes in advance on proposed standards relating to materials and manufacturing processes. After a standard has been made effective this department is responsible for checking its working in actual practice and for seeing that it is being maintained by the Production Department.

The Inspection Department is responsible for checking incoming materials against specifications and for inspecting finished products and materials in process to see that the standards of quality are maintained by the Production Department.

The Purchasing Department is responsible for ordering materials and supplies according to standard specifications.

The Planning Department is responsible for maintaining inventories at proper levels, for the prompt shipment of orders and for handling and storing raw materials and finished products according to standard practice.

The Maintenance Department is responsible for the application of maintenance standards.

The Accounting or Cost Department is responsible for compiling information which will show the relation of actual to standard costs.

No standard becomes effective without first being submitted to the responsibility head directly responsible for its application. If he approves it, such approval signifies his agreement that the standard is reasonable, and his acceptance of full responsibility for its application. Usually he is kept fully informed during the process of development, and in every case he is given full opportunity to study the proposed standard and, if he does not fully approve of it, to suggest revisions. His suggestions are given careful consideration. If they are sound, the proposed standard is revised; if not, the reasons are pointed out to him. Our method is to "sell" the standard, if possible, rather than to force it. While this method may require some additional time, we find it is time well spent, as it forestalls many of the excuses commonly heard for failure to meet standards.

As an incentive for meeting standards, we distribute publicly and periodically certain cost information which we have found very effective. The departments are grouped according to their cost showing for the past month. In Group No. 1 we include all departments which have established a low cost record for the year. In the first monthly report after starting, Group No. 1 included eight departments; in the second, twenty; in the third, thirty.

In our work of developing standards we are giving careful thought to avoid overemphasis of one or more factors at the expense of others. In considering the performance of a foreman against standard, we include orderliness, maintenance of equipment, promptness of shipments, condition of personnel and safety record, as well as production and costs.

After all is said and done, standards are not an end, but a means to an end. The adoption of various standards in a process or series of processes is but one phase of an effort toward routine operation of the process or processes, and it is quite evident that in any operation the nearer we approach to perfect routine operation, the nearer we approach to uniform quality and

costs. This, in turn, carries with it a minimization of managerial duties and even of executive duties.

In any industry such as the wrought iron industry, which is a composite of a relatively large number of individual processes in themselves intricate, it is necessary, in the adoption of standards and controls of which the standards are a part, to evaluate carefully the precision of control and standards which is possible, and also (and this is a very important part of the consideration) justified.

It is quite conceivable that in some processes, and there are many such, the utmost precision in standards and control is essential to insure the proper quality and to insure costs which will permit the competitive sale of the product. On the other hand, there are many processes where a considerable variation either in control or standards does not give prohibitive results either in quality or cost. In such a case, the expense of great refinement in standards and costs would of course be unjustified; or, in the case just enumerated, while a more accurate system of control and standards might be desirable and give some improvement in quality or manufacturing costs, the very cost of the intricacies of the control system might make further precision unjustified. The idea I am intending to convey is that one of the most important factors in a study of controls and standards in a business such as the wrought iron industry, with its large number of processes, all of which are more or less complex, is to evaluate the degree of precision that is possible and then to evaluate the degree of precision that is justified. So we may conclude by saying that we are interested, first, in the need of precision; second, in the ability to get precision; and third, in the cost of securing precision; and it is with these basic ideas in mind that we are developing a system of standards and controls.

Reference Temperature for Limit Gages

One of the important features to be standardized when a national standard system of fits and limit gages is established is the reference temperature of the gages. In this country, the temperature of 68 F (20 C) has been adopted as a national standard. It has been laid down in the American Tentative Standard on Tolerances, Allowances, and Gages for Metal Fits (B4a-1925) and is generally used by gage manufacturers. The same temperature has also been proposed or adopted as a national standard in the following countries: Austria, Belgium, Czechoslovakia, Denmark, Finland, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Norway, Poland, Russia, Sweden, and Switzerland.

Until recently, there were only two exceptions to the adoption of the 68 F temperature by industrial countries. One was Great Britain where the temperature of 62 F was in use, because it is the temperature at which the British Imperial Yard is defined. The other was France, which used the reference temperature of 0C (32 F), this being the temperature at which the meter is defined.

When international cooperation in the standardization of tolerances for fits and limit gaging was started some years ago under the procedure of the International Standards Association (ISA), this brought up the question of unifying the reference temperature for gages internationally, if possible. The French industry agreed to adopt the reference temperature of 68 F for limit gages and industrial measuring instruments on condition that it actually be adopted in an international way. British industry was canvassed by the British Standards Institution (then still called the British Engineering Standards Association) as to whether it would not also adopt the 68 degree temperature for the sake of international uniformity. The reply to this canvass has been in the affirmative. This result is no doubt also due to the fact that the reference temperature of 68 F has been adopted for gages, etc., by the International Committee on Weights and Measures. Following the decision of the latter body, the National Physical Laboratory (which in Great Britain plays a role similar to that of the Bureau of Standards in the United States) has, since January 1, 1932, given all measurements of engineers' gages, micrometers, and similar objects at the temperature of 68 F, instead of 62 F, unless definitely requested to do otherwise.

The difference between two steel gage blocks of the same nominal size made to the reference temperatures 68 F and 62 F, respectively, is relatively small. In fact, the difference between two such blocks with a nominal length of one inch is about 38-millionths of an inch when they have the same temperature. This difference would compare to a difference of less than 0.6 inch on the height of the Empire State Building in New York (1250 feet). However, in spite of the relative smallness of its effect, the influence temperature must be given due consideration in many cases where parts are to be held between close limits. Thus, for example, the gaging of precision parts is being now carried out in some plants in a room where the temperature is kept at a constant level, for example, 68 F.

Standardization and Single-Unit Production in the Machine Industry

by

H. von Selzam[1]

The planning of standards and some accomplishments of standardization work in a large German manufacturing organization

In standardization work, distinction should be made between:

1. Dimensional standardization; that is, the specification of the dimensions of machine elements. The development of this kind of standard has been nearly completed in Germany.

2. Specifications for the methods of measuring and testing, and quality specifications making it possible to judge a product in one definite way and to keep the supply of the product up to standard.

In mass production, the establishment of specifications is of special importance. For this reason, great stress has been placed on specifications in the United States, particularly by the automobile industry. It is true that dimensional standards also yield certain benefits, but these are of minor importance as compared with those influencing production methods.

For example, when the A. O. Smith Corporation in Milwaukee—to refer to an extreme case—is able to manufacture daily 3600 automobile frames by means of automatic machines, a specific component part used once in every frame must be manufactured in 10,800 pieces, for each manufacturing period of three days. The use of the same part in several types of frames would perhaps double or triple this quantity. However, the reduction in cost per frame obtained in this way would hardly be noticeable.

However, if it is possible, without spending too much money, to change the technique of production in such a way as to increase the daily production of the entire frames from 3600 to 4500, it is possible to arrive at a considerable reduction of the manufacturing cost per frame.

In manufacturing special units in a machine industry that is required to comply to a high degree with the needs and wishes of the customers, the conditions are entirely different. Here, the dimensional standardization is of special importance. By making the greatest possible use of component parts from which the several products are assembled, an effort must be made to increase the numbers in which these elements are made in order thus to arrive at more economic manufacturing and stock-keeping.

Single-unit production requires a considerable amount of design and production planning. With the present strong competition, only those firms which are able to restrict these activities to a minimum will survive in the long run. The more a designer uses previous designs, the more time he has for the careful preparation of new ones, for the manufacture of clear and simple drawings which are needed especially in single-unit production, and for the thorough examination of all problems involved in the work.

In the planning of work, the data concerning labor rates and time schedules can be used repeatedly; the travel of the work through the plant is expedited; the possibility of errors in routing the work and in selecting the machines to which it is assigned is decreased, and differences of opinion on pay rate questions are practically eliminated. In the final resort, it is here that order in the mass of details must lead to a reduction in manufacturing cost and a shortening of the terms of delivery.

The following example will give an illustration of the order of magnitude of the savings that may be obtained even with small parts. Two of such parts were used, with minor differences, for 14 control valves of different sizes. They were drawn out in ink for each new valve, and they were filed under 14 different drawing numbers. In 1930, a total of 190 pieces were required. Therefore, about 13 of the pieces concerned were made, on the average, per drawing. If the designer had made these two parts uniform for the 14 valves and if he had combined them in a single drawing number—as was actually done later—the required 180 pieces could have been manufactured in two lots of 90 pieces each, instead of in 72 individual orders. The savings on cost and time obtained by manu-

[1] Berlin, Germany.

facturing for stock amounted to 30.3 per cent on cost, and to 41.3 per cent on time, as compared to the single-unit production.

In single-unit production, the designer is also expected to comply with the special wishes of the individual customer and to create a product that is technically perfect, while on the other hand he must use the smallest number of new parts possible. In making the design, he must keep well in mind the following fundamental rules:

1. Use as many stock parts as possible.

2. If stock parts do not serve the purpose, have recourse to the existing standards and refer to these with the correct designation and standard number.

3. If the existing standards also fail to suit the purpose, find out whether a similar construction has been used before and if it can be used again.

One important German company has established a *Book of Works Standards* in order to facilitate the functions referred to above, in its different engineering departments. The products made by this firm comprise hydraulic pumps, air and gas compressors, refrigerating plants, vacuum pumps, stationary and marine steam engines, steam turbines, locomotives, chemical apparatus, boilers, pipe lines, valves, and vacuum cleaning machinery. The *Book of Works Standards* has been conceived as a handbook and is intended to be placed at the disposal of the largest number of designers possible. On the average there is a copy for every two designers. The book is intended to give information as to what materials are available and for what purposes they are particularly suited; what parts are kept in stock and which of these are standardized; what considerations should apply to the design of simple machine elements for general use, in case stock parts or standards do not exist. Finally, the book contains indications as to how drawings should be made and data concerning the commonly used screw threads, fits, tolerances, etc.

In its present form, the book still contains much superfluous matter and it omits other data that really are needed. However, the main object was in the first place to collect the material available. The next problem is to bring about the necessary restriction, and on the other hand, completion of the standards.

To achieve this purpose, the following three means are used:

1. The stockroom notes the degree to which stock parts are regularly used.

2. The frequency of the use of the non-stocked standard parts is checked by means of the regular part lists of the standards department.

3. All non-standard small machine elements, suitable for general use, as needed daily in the several engineering departments, are drawn out on single sheets and filed in the standards department for future observation and possible use.

However, it is not sufficient to establish standards. It is necessary also to see that they are adopted in practice to the greatest extent possible. The supervision in this respect is in the hands of the checker of drawings who must see and countersign every drawing and every part list before it goes into the workshop. In order to reduce to a minimum the time necessary for this supervision, the checker regularly goes the rounds of the engineering department twice a day. In each office a table is reserved for him on which the drawing and part lists to be examined are awaiting his visit. Any points requiring clarification or change may thus be discussed at once with the designer whose work is under examination.

This method has been found to be very satisfactory, saving about a day's time, as compared with the previous method of sending the drawings for examination to the standards department. Furthermore, the original drawings were saved considerable wear and tear by the elimination of the transportation, and finally the expensive and disturbing trips of the designers to the standards department—which formerly were a matter of daily occurrence, in urgent cases—have been eliminated.

In addition to the actual checking of standards the checker is able to fulfill another important function, since his constant close contact with all engineering departments makes it possible for him to transmit the experience gained by specific departments to all divisions. He must develop the initiative for tackling important problems that arise, for the purpose of bringing about a solution based on the principle of unification.

The subject so far considered has been, in general, smaller parts. In regard to larger parts, standardization and stock keeping does not enter into consideration to such an extent, but on the other hand, the repeated use of such large parts will result in the saving of considerable expense for design, computation, and patterns. The latter point is especially important. This appears clearly if one only realizes how wastefully the cost of manufacture, stocking, and maintenance of a pattern is spent if the latter is used only once for making a casting.

With a view to the importance of this matter, one man in the standards department is in special charge of the pattern department. A

card file, carefully kept up-to-date, supplies the data required.

In many cases it is not possible to use existing patterns. However, instead of making a new pattern, it is often better to change an existing pattern so as to adapt it to the new case. The pattern then remains in this changed condition until a casting of the original pattern must be made again, or until a further change of the pattern is required.

As the file card records every casting of a pattern, together with its date, and as furthermore every change of the pattern—whether of a temporary or a permanent nature—is also carefully recorded thereon, it is possible to determine the condition of a pattern at any time.

In case, after a change in the pattern, a casting is no longer interchangeable with previous castings, special measures must be taken to prevent the manufacture of wrong castings. This could happen very easily, for example, if a casting according to design A were ordered by one department, and approximately at the same time a casting B by another department. The most obvious remedy would then probably be to give the casting made from pattern B a different pattern number. However, the change in the number of the pattern causes certain difficulties from the viewpoint of the pattern department, especially if such change is made rather frequently.

A very simple solution of this problem consists in adding to the pattern number a special *part* number for each design, this part number to be separated clearly from the pattern number by a slant. This part number is repeated on supplementary parts belonging to a specific design, but it is not specifically mentioned on the main pattern. However, the part number must appear in the part lists and on the drawings, and it thus at once indicates clearly (1) that in the case under consideration one has to do with a pattern subject to changes, and (2) what pattern is desired.

In the same way as the checker of drawings, the checker of patterns also goes through the departments daily to see that consideration is given to existing patterns as early as possible in the designing stage. He furthermore supervises the changes and makes the necessary sketches to be transmitted to the file cards. This man being a trained pattern maker, he is also in a position to give the designers information regarding pattern making and foundry practice. The fact that the functions of such a pattern checker pay for themselves is proved by the fact that in the period from January 21 to January 30, 1931, a saving of about 340 marks was made by the use of existing patterns instead of making new ones. In February, 1931, the corresponding saving was about 500 marks, and in March, 1931, 670 marks.

In a consistent pursuit of its goal to effect a reduction in the manufacturing costs of its several products by using machine elements for the largest possible number of purposes, the company referred to above has standardized, for example, the guides of its horizontal piston engines. For the range of pressures up to 15,000 kilograms inclusive (about 33,000 lb), there are now only 6 guides instead of the previous 28. These guides are used for vacuum pumps, air compressors, steam engines, and ammonia compressors, independent of whether a standard design or a special design is involved. The guides for piston strokes from 250 mm (about 10 in.) upward may also be used for low pressures—as commonly applied, for example, in compressors for sugar factories—for the next larger stroke in the series. They are then combined with a lighter driving mechanism and in this way the number of bearings, connecting rods, and crossheads was increased by four light types, to ten types each. Altogether, the standardization work done in this particular line resulted in the following reductions in the number of types and sizes used:

	Before standardization	*After standardization*
Guide with lateral cover	28	6
Guide supports	42	20
Crank guards	19	6
Connecting rods	46	10
Crossheads	49	10

A single guide is now used for the following standard types so far established for the different machines: four air compressors; three steam engines; and five ammonia compressors.

Air compressors and ammonia compressors, for example, have the same crankshafts with the exception of the double crank tandem compressor. The length of the crankshafts is determined by the largest air cylinder comprised in the series concerned, but for the sake of restriction, no shorter crankshafts—which could have been used for some types—were adopted.

The cylinders for the air compressors were designed in such a way as to make it possible, for example, to transform a 4-atmosphere single-stage compressor into an 8-atmosphere tandem compressor, through the addition of a distance piece and a cylinder; or to obtain an 8-atmosphere double-crank tandem compressor by coupling the 2-atmosphere single-stage compressor and the 6-atmosphere single-stage compressor. The guides are always used to their full capacity in these cases.

With respect to the horizontal air compressors the planned standardization and simplification work has so far brought about the establishment

of 29 different designs. These include 6 sizes of compressors for each of the following pressures: 2, 4, and 6 atmospheres; and 11 sizes of 8-atmosphere compressors. The 29 designs require:

6 different guides with their subgroups
6 connecting rods
6 crossheads
14 crankshafts
13 flywheels
21 cylinders
16 cylinder heads
16 pistons
5 valves

Concluding, it can be said that, more particularly in building single machines, dimensional standardization and simplification are likely to yield special benefits in the reduction of manufacturing costs. These advantages consist, among other things, in the possibility of manufacturing the component parts of the different products in larger lots; and in the use of existing designs, which results in utilizing work once performed to the greatest extent.

Proposal for Standardization of Plumbing Equipment Discussed

The work of the Department of Commerce Subcommittee on Plumbing and the comments aroused throughout the country by its reports were recently discussed by William C. Groeniger in an article entitled "Movement for a National Plumbing Code" published in the *Plumbers and Heating Contractors Trade Journal*. Mr. Groeniger is chairman of the sectional committee on Standardization of Plumbing Equipment (A40), working under ASA procedure, as well as chairman of the Department of Commerce Subcommittee on Plumbing. The Subcommittee on Plumbing, which was appointed by the Secretary of Commerce some years ago, published a revised report in 1929 which is now before the industry for consideration.

Mr. Groeniger writes in part as follows:

"Criticisms of the committee's report are mostly directed at tables of pipe sizes, distance of traps from vents, methods of making vent connections, and group venting. These are a part of the suggested detailed code. In my opinion the suggested detailed code (while important) is secondary to the establishment of:

1. The correct definition of plumbing
2. The relation of plumbing to health
3. Public control of plumbing justifiable
4. The legal principles
5. Basic plumbing principles

"These five important subjects may be found on pages five to 15, inclusive, of the 1929 report. Each and every one is of greater importance than the detailed code. These principles specify results desired without specifying the details of construction.

"Starting with the fundamental principle that plumbing regulations are applications of the police power in the interest of health, the following ideas must be kept steadily in mind:

1. The finest system of plumbing in the world will not make a building safe but will assure the persons who occupy the structure that certain health factors have been provided.

2. Plumbing in a building is not installed for the safety of the structure but for the health, comfort, and convenience of the occupants.

3. Any plumbing regulations having to do with a code of rules, the administration of said rules, the licensing and examination of plumbers are applications of the police power in the interest of health.

"Those who criticize the detailed code must try and understand that the report of the Subcommittee on Plumbing, including the detailed code, allocates plumbing to a health department and not to a building department. They must recognize that plumbing is regulated and controlled to protect persons against injury to health.

"During the last 30 years the plumbing industry has permitted the matter of control and supervision to be detoured, divided, and generally misunderstood. The report of the Subcommittee on Plumbing points to safe, reliable, reasonable, common sense plumbing control, and administration."

As an interesting sidelight on the program now under way to develop a national code for plumbing and standardization of plumbing equipment, a recent investigation of the Division of Building and Housing of the Bureau of Standards, Department of Commerce, has indicated that many cities in the country are operating under plumbing codes and also building codes that have been in force from 10 to 20 or more years. Many of these codes are now largely outmoded by increased knowledge of sanitary engineering and by developments in the plumbing industry. A uniform code and standardized equipment under the control of active national committees would maintain practice and equipment in step with current developments and avoid out-of-date installations.

Legislation Proposed on Certification and Labeling

Two bills dealing with certification and labeling have been introduced in Congress, one by Mr. Huddleston in the House of Representatives and one by Senator Hastings in the Senate. The text of the two bills follows:

H.R. 315, "A bill to prevent frauds in commerce, and for other purposes," presented to the House of Representatives on December 8, 1931:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Bureau of Standards is authorized to adopt and prescribe marks indicating the quality, durability, usefulness, size, strength, grade, quantity, composition, origin, date, and process of production, weight, and measure of all of the subjects of commerce, and to adopt regulations for the use of such marks thereon or therewith.

SEC. 2. It shall be unlawful to place in interstate commerce any subject of commerce without having complied with the regulations, if any, applicable thereto which may have been adopted under the authorization of the first section of this Act.

SEC. 3. It shall be unlawful for any dealer, or any person who has acquired same for the purpose of resale, to remove from any subject of commerce any mark placed thereon in compliance with this Act.

SEC. 4. Violations of this Act shall be punishable by imprisonment for not more than two years and a fine of not more than $5000, either or both.

S. 1337, "A bill to prevent the use in markings or advertisements of language relating to certification by the National Bureau of Standards" presented to the Senate on December 10, 1931:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it shall be unlawful for any person to state or cause to be stated in any label, stamp, or other marking, or in any advertisement, or to use or cause to be used in any label, stamp, or other marking, or in any advertisement language from which it can reasonably be implied, that the National Bureau of Standards has certified the quality or formula of any article labeled, stamped, marked, or advertised or is authority for any statement relating to such quality or formula.

SEC. 2. It shall be unlawful for any person to state or cause to be stated in any label, stamp, or other marking, or in any advertisement or to use or cause to be used in any label, stamp, or other marking, or in any advertisement, language from which it can reasonably be implied, that the Government of the United States has certified the quality or formula or any article labeled, stamped, marked, or advertised or is authority for any statement relating to such quality or formula meaning thereby that the National Bureau of Standards has certified such quality or formula or is authority for such statement.

SEC. 3. This Act shall not apply to the labeling, stamping, marking, or advertising of any specific article which before being offered for sale has been actually examined, tested, and approved by the National Bureau of Standards.

SEC. 4. Any person who violates any provision of this Act shall, upon conviction thereof, be fined not more than $5000, or imprisoned not more than one year, or both.

SEC. 5. As used in this Act, the term "person" includes an individual, partnership, association, or corporation.

SEC. 6. This Act shall take effect ninety days after the date of its enactment.

A.S.T.M. Symposium on Rubber

A pamphlet, *Symposium on Rubber*, containing the papers on rubber presented at the Cleveland Regional Meeting of the American Society for Testing Materials, has been published and is available for loan from the American Standards Association, or may be purchased for 50 cents per copy from ASA or from the American Society for Testing Materials.

The *Symposium on Rubber* comprises five papers under the general heading of Manufacture of Rubber Products presented at the morning session of the symposium, and seven papers on Properties of Rubber as an Engineering Material presented at the afternoon session.

Specifications for Dry Colors

At a recent convention of the Federation of Paint and Varnish Production Clubs it was recommended that a standard set of specifications for the examination of dry colors be adopted. Tentative specifications already drawn up include: the proposed and already widely used practical method of making tests; a description of all apparatus and material used; a guide, showing suggested amounts of oil and dry color necessary to conduct tests; the number of mulls or rubs necessary for each type of pigment; and amounts of white or blue reduction paste to be added when testing for tinting tone.

German Standard Practice in Surface Designation[1]

by

John Gaillard, *Mechanical Engineer*
American Standards Association

Methods specified in the German National Standard for indicating quality of surface finish on working drawings

Increasing interest has been shown during the last few years in the establishment of a standard method of indicating on drawings the nature of the surface of workpieces. The purpose is to convey complete information to the production department as to whether the surfaces should be left rough or be given a finish, and in the latter case, the character of this finish.

In addition to finishes produced by metal-removing processes, others, such as painting, enameling, and electroplating, must sometimes be specified. An analysis of the general problem shows that quite a number of items have to be considered, and the setting up of a standard system of surface designations is, therefore, rather an elaborate task. A start in this direction has been made by sectional committee Z14 on Drawings and Drafting Room Practice organized in 1926 under the procedure of the American Standards Association. (This committee is sponsored by the American Society of Mechanical Engineers and the Society for the Promotion of Engineering Education.)

Work on the subject has also been undertaken by a technical committee on drawings organized under the auspices of the International Standards Association. (The ISA is a federation of 18 national standardizing bodies including the American Standards Association. Its main purpose is to avoid or eliminate unessential differences between national standards.) In May, 1931, this committee held a meeting in Copenhagen, Denmark, where the German national standardizing body submitted the latest revision of its own national standard, a complete and thorough piece of work, for consideration for international usage. This development is of interest in this country, particularly as many inquiries on the subject have been received by the American Standards Association in the last few years.

As fundamental in regard to the designation of surface finishes, mention should be made here of the work to be undertaken by a committee now being organized under the procedure of the American Standards Association to establish a standard classification of surfaces according to their quality. When this has been done, a specific machine finish may be indicated on a drawing by a symbol or quality number, in the same way as this is done for a standardized screw thread or fit. However, only the question of surface designation on drawings rather than the more fundamental question of surface classification is dealt with in the German standard. The scope of this article is therefore restricted to this subject.

The German standard (DIN 140—six sheets—published in revised form in October, 1931) is based on the consideration that the drawing of a workpiece must indicate the nature, and if necessary, the quality of its surface as required either by the functioning of the workpiece when assembled or merely by its appearance. This indicates a tendency toward greater completeness and explicitness of the drawing. A similar tendency exists where fits are specified on the drawings by the manufacturing limits for the mating parts instead of leaving the establishment of the correct fits to the production department. Modern manufacturing methods demand that the workshop receive complete and clear instructions. It is the duty of the engineering department to issue only such instructions as can be carried out with the production equipment available. This condition can be reached only by due cooperation between the engineering and production departments.

Surfaces are classified by the German standard into three groups: (1) rough, (2) finished, and (3) treated. The term "finished" applies to any surface from which metal has been removed either by hand, such as filing, or by mechanical means, such as turning or grinding. By "treating" a surface, the Germans mean its being subjected not only to heat-treatment but to any treatment other than a metal-removing process.

[1] Reprinted from *American Machinist*, April 7, 1932.

Electroplated, painted, varnished, or zinc-coated surfaces are thus comprised in the group of "treated" surfaces, as well as case-hardened surfaces, for example.

The three main classes are described and subdivided as follows:

1. Rough Surfaces.

(*a*). Surfaces of workpieces produced by the most commonly used processes, such as rolling, forging, casting, autogenous cutting, may be permitted to conserve the relative natural roughness resulting from these processes.

(*b*). In other cases, the surfaces, although permitted to remain rough—that is, requiring no special finish by means of a metal-removing process—must be of a better quality than would result from the ordinary production processes mentioned under (*a*). Such surfaces may be obtained by more refined production processes, such as, for example, smoothing in a die, or by specially accurate forging, casting, or autogenous cutting.

(*c*). Sometimes, a surface produced by a more refined process as referred to under (*b*) still shows certain unavoidable, but nevertheless non-permissible defects requiring local correction, for example, by grinding or filing. In this connection, the German standard explicitly states that the removal of fins from castings, as taken care of in the foundry, does not come under this heading.

2. Finished Surfaces.

If the surface of a workpiece must be of a higher quality than that obtainable with any of the processes mentioned under Class 1, it must be given a special finish. Distinction is made between two subgroups of finishes as follows:

(*a*). Plain finishes, consisting of metal-removing processes, such as turning, boring, milling, planing, grinding, and filing. The difference in quality of finish resulting from these various processes will be dealt with later.

(*b*). Special finishes, that is metal-removing processes intended to produce a high quality of surface, or to impart a particular character to a surface that has already been given one of the plain finishes referred to under 2*a*. Such special finishes are, for example: lapping, honing, scraping, polishing.

3. Treated Surfaces.

Certain surfaces, whether rough or finished, require a "treatment" usually having for its purpose a change in the properties of the material (hardening, annealing); or protection of the surface against corrosion (electroplating, painting); or again, improvement of the appearance of the surface (polishing).

Smoothness	Accuracy of shape	Representation of surfaces
imperfect	imperfect	
imperfect	good	
good	imperfect	
good	good	

TABLE 1

The German standard gives the above table listing the four possible combinations of accuracy of shape and smoothness of surface. This serves to visualize the difference in concept between these two factors

For each of the above three main classes and also for the subgroups 2*a* and 2*b*, a standard method of indicating the nature of the surface is given in the German standard. Before proceeding to the listing of these methods, the standard explains that the quality of the surface finish of a part, and its quality as to accuracy of shape, are two different things. Accuracy of shape is dependent on the manufacturing limits between which a part is held. For a cylindrical part, this concerns the diameter as well as out-of-roundness and straightness. Quality of surface finish depends on the size, the frequency, and the distribution of the minute unevennesses

Surfaces with a quality of finish obtainable, without removing metal, by means of ordinary production methods, (rolling, forging, drawing, pressing, autogenous cutting, casting	No excess material to be left for finishing process.	
Surfaces with a quality of finish obtainable, without removing metal, by means of more accurate production methods (accurate forging, smoothing in a die, accurate casting, accurate autogenous cutting. Surfaces are machined only if requirements are not met by the processes in question		~
Surfaces with a quality of finish obtainable for example by means of a rough finish metal removing process, applied once or several times. Tool marks may be tangible and clearly visible to the naked eye	Excess material to be left for finishing process.	▽
Surfaces with a quality of finish obtainable for example by means of a medium-finish metal removing process, applied once or several times. Tool marks may still be visible to the naked eye	The amount is to be specified separately, for example in the instructions given to the shop.	▽▽
Surfaces with a quality of finish obtainable for example by means of a high-finish metal removing process applied once or several times. No tool marks should be visible to the naked eye		▽▽▽

TABLE 2

Rough surfaces (Class 1) and plain finishes (Class 2a) are designated by symbols. The "approximate" sign derives its name from the fact that it has been standardized in Germany as a symbol indicating that two values are approximately equal, for example, one inch—25.4 millimeters (the accurate figure being 25.40005)

by which the surface deviates from an ideally smooth surface. Generally speaking, quality of surface may be said to be identical with smoothness. This is not entirely true, but this question cannot be dealt with in detail here.

. Both characteristics of a surface, accuracy of shape and smoothness, are permitted to vary to a certain extent depending on the nature of the function which the workpiece has to fulfill. In the absence of a standard classification, quality of surface has sometimes been specified by reference to a series of samples, each representing a certain degree of coarseness or smoothness, serving as a guide in manufacturing the product.

The German surface designations may be divided into two groups. One group applies to surfaces classified under item (1) rough surfaces, and (2*a*) plain finishes. The second group comprises designations for surfaces classified under item (2*b*) special finishes, and (3) treated surfaces.

The former group of designations is listed in Table 2. According to the German standard,

1	Surface symbols should normally refer to the lines representing the surfaces concerned. If space does not permit this, they should refer to auxiliary lines forming extensions of the sur face lines	
2	For a surface of revolution, such as a cylinder or a cone, the symbol should refer to one generating line only	
3	If all surfaces of a workpiece are of the same nature, the surface symbol should be placed after the part number or near the sketch of the workpiece. In this case the surface symbol should be made larger than those referring in the normal way to surface lines, in order to stand out more clearly	5▽▽
4	If most of the surfaces of a workpiece are of the same nature, the corresponding symbol may be placed after the part number or near the sketch of the workpiece (as in Example 3), the symbol for the surface that forms the exception being added in parentheses. The latter symbol should be added also to the surface lines concerned. The same method may be applied in cases where two different symbols are used for surfaces forming exceptions	3▽▽(▽)
5	If a part is represented in more than one section or view, the surface symbols should be inserted only in that section or view where the dimensions are given	
6	If two parts represented in assembled condition have the same kind of surface, the symbol should be inserted only once	Scraped
7	If only part of a surface is required to have a specific quality or is to be subjected to a specific treatment, this should be indicated by means of a dimension line (either with or without a dimension figure) placed closely to the surface symbol. If necessary, a dimension figure should be placed closely to the symbol	
8	Surface symbols referring to gear tooth flanks that are not shown in the drawing (because of diagrammatic representation of the gears) should refer to the pitch circle, either in the side view of the gear or in its cross-section. For small sketches of gears, the symbols may be accompained by leaders	
9	If a ceramic product requires the same surface treatment throughout, with the exception of a few surfaces that are not to be treated, the latter surfaces may be indicated by dot-and-dash lines. An explanation should then be added to the part number or placed closely to the sketch of the product	5 Glazed, except surfaces marked - - -

TABLE 3

In addition to the main rules for indicating the nature of workpieces, the German standard includes series of examples of practical applications. These examples give certain additional rules.

	Surface Requirements	Process	Workpiece
10	Accurate and smooth	Cold drawn	Bright drawn
11	Accurate and smooth	Medium finish, turned or ground	
12	Very accurate and smooth	High finish, turned or ground	
13	Free of coarse unevennesses	Malleable iron casting; imperfections removed if necessary	
14	Smooth surface; no particular requirements as to accuracy	Die-forged and made bright	Made bright
15	Accurate and smooth	Turned from a forging or from the solid, medium finish	
16	Accurate and polished	Turned from a forging or from the solid, medium finish, and polished	Polished
17	No particular requirements as to accuracy. Dull nickel-plated	Die-forged, beaten bright, and dull nickel-plated	Dull nickel-plated
18	Surfaces cylindrical and plane, respectively, and smooth	Outside and end faces: medium finish, turned or ground. Hole: medium finish, bored or reamed	4▽▽
19	Very accurate and smooth, except the end faces which require a smooth finish only	End faces: medium finish, turned. Outside and inside surfaces: high finish, turned, reamed, or ground.	
20	Very accurate and very smooth, except the end faces which are only to receive a smooth finish	End faces: medium finish, turned. Outside surface: high finish, turned or ground, followed by lapping. Hole bored, ground, and honed.	Lapped Honed
21	Tooth flanks free of coarse unevennesses. Bore cylindrical and smooth. All other surfaces to remain rough.	Cast. Teeth, if necessary, freed of unevennesses by filing or grinding. Hole: medium finish bored or ground	
22	Bore accurately cylindrical and very smooth. All other surfaces to be given a smooth finish. Surface of recesses remains rough.	Gear cast or pressed. All surfaces medium finish, except recesses. Hole: high finish, bored or reamed	
23	All surfaces rather accurate and smooth. Tooth flanks and bore to be very accurate and smooth	All surfaces of gear turned. Recesses rough-turned. All other surfaces: medium and high finish, respectively. Tooth flanks ground.	
24	All surfaces to have a smooth finish. Rim to have a certain roughness as obtained by knurling, in the present example with a pitch of 0.6 mm	All surfaces medium finish, turned. Rim knurled	Knurl 06 7▽▽
25	Smooth, white enameled surfaces	Sheet metal cup drawn. Surfaces cleaned (pickled and dried) and enameled	18 white enameled

TABLE 4

For each of the workpieces, the requirements for the quality of finish for one or more surfaces are listed, together with the mention of the process by which this finish may be produced, and the standard method of designation. Incidentally, several of the workpieces represented would require more than one surface designation on the drawing, but for the sake of simplicity, only one surface quality has been selected in each illustration

they are meant to be used on the drawings to indicate the character of the surface but not any specific finishing process to be used for obtaining the surface in question. If, therefore, the work-

shop for some reason wishes to produce a certain quality of finish by grinding instead of by reaming, it is left free to do so. Also, the finishing processes given in Table 2—such as rolling and forging—are meant merely as guides to quality of surfaces, not as definite instructions to the workshop.

In reference to the surface symbols in Table 2, the German standard states that each of these applies to a certain range of surface qualities. Within this range, the surface quality will vary somewhat, depending on the nature of the finishing process, the material of the workpiece, and its dimensions. In other words, there are supposed to be two "limits" of surface quality between which the actual surface quality of the workpiece must lie, just as the actual size of the workpiece must lie between two manufacturing limits. Evidently, the surface quality of the workpiece indicated by the symbol must be at least equal to the lowest "limit of quality."

In this connection, it should be observed that in so far as there does not yet exist a standard basis of measurement for the quality of a surface, recourse must be taken to physical samples of surface finishes: rough, turned, ground, lapped. In making up such samples, it may be feasible to establish one sample representing the "high limit," and another sample representing the "low limit" of quality. However, the practice so far has been rather to establish a number of nominal surface finishes with which the surfaces of the workpieces concerned must be practically identical, or which they must at least approximate with reasonable closeness.[2] There remains an element of personal judgment in the use of a classification scheme of this kind, but so far it has been the best that could be done. It is expected that the situation will eventually be improved by the work of the new sectional committee.

Surfaces requiring a higher quality of finish than those obtained by "plain" machining (Class 2*b*), and those requiring a "treatment" other than a machine finish (Class 3), are not accompanied by a symbol on the drawing, but by the term indicating the finish, written out in full.[3] The designation by name of such a finish is added to the symbol designating the plain finish (see Figure 1). The German standard recommends that each manufacturing concern establish a list of all terms used in its production methods, illustrated by practical examples. To this, the writer would add that many such terms are suitable for a general standardization and therefore might well be incorporated into a national standard so as to give the maximum degree of mutual understanding between all groups concerned.

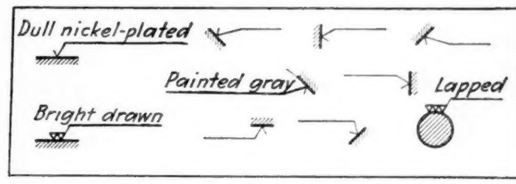

FIG. 1

Finishes other than rough or plain machine are designated by lettering the name of the finish and indicating by a leader the surface affected

For the sake of easy reading, the German standard specifies that a word designation of a surface finish should be written in the horizontal direction above the "leader," independent of the position of the surface to which the symbol refers. In case the word designation is added to a surface symbol, the "leader" should terminate in the symbol (Figure 1).

Word designations of surface finishes should refer to the nature of the finish, and not to the process by which the finish is obtained. This principle has been adopted to leave the manufacturer the greatest possible liberty in the method of producing a surface of a specified quality. For example, if a lapped surface is specified on the drawing and the workshop should be in a position to produce an equivalent surface by some other means—say by applying a newly invented process—it is permitted to apply this alternative method, according to the German standard. Similarly, the general word designation "painted gray," for example, leaves the workshop free to apply the paint either by means of a brush or by spraying or dipping.

The German standard also deals with the question of auxiliary processes, that is, processes which either may or must be carried out in order to obtain the finish specified by the word designation. If such an auxiliary process is a necessary part of the general method of applying the finish, it should not be mentioned. Thus, the cleaning of the workpiece before it is electroplated, or its being dried after this treatment, are not recorded on the drawing. On the other hand, if a surface must be stained before being painted, this fact should be mentioned on the drawing, as painting is not necessarily preceded by staining.

[2] See also "Standards for Surface Finishes," by S. M. Ransome (*American Machinist*, Vol. 74, page 581) and "Standardization of Machining Finishes," by R. C. Deale (*Mechanical Engineering*, Vol. 53, page 723; reprinted in the ASA BULLETIN, November, 1931, page 22).

[3] The German standard mentions that the method of word designation in combination with "leaders" may also be applied for indicating such methods of connecting parts as cannot be shown on the drawing (glueing, soldering, shrinking); for indicating methods of making tight connections (caulking, filling with lead); or for indications applying to the method of assembly (drill when assembled, rivet during erection). However, designations of this kind have no bearing on surface quality.

Statistical Methods and Industrial Standardization

Upon invitation of the University of London, Dr. W. A. Shewhart, engineer in charge of fundamental quality engineering, Bell Telephone Laboratories, New York, sailed recently from New York to give a course of three lectures on "The Role of Statistical Method in Industrial Standardization" at the University.

An announcement by the University of London makes the following statement concerning these lectures:

"Modern industry offers one of the most fertile fields of application of modern statistical theory. Both the physical and economic problems involved in making the best use of scientific results in the production of manufactured articles, where it is necessary to try to make the same thing again and again, are inherently of a statistical character. The engineer or manufacturer may be regarded as belonging to an organized group of producers attempting to make use of physical laws and physical properties, both statistical in nature, in the development and production of fabricated material to satisfy the human wants of the consuming public. From this point of view the central problem may be looked upon as one of industrial standardization. The present series of three papers has therefor been entitled 'The Role of Statistical Method in Industrial Standardization.'

"An attempt will be made to outline the present status of the applications of modern statistics and to call attention to certain fundamental problems in industrial development, the solution of which requires the use of not only some of the most recently developed theory but also of theory not yet available.

"The first paper [Economic Control of Quality of Manufactured Product] will indicate how statistical theory may be used in the establishment of a scientific basis for determining when we have gone as far as it is economically feasible to go in eliminating unknown or chance causes of variability in the quality of a product and will indicate by illustration the way in which statistical control leads to five important economic advantages.

"The second paper [Random Sampling from an Engineering Viewpoint] will outline the role of the theory of random sampling in helping the engineer to plan rational sampling procedures, to determine the proper sample size, and to make the most efficient use of engineering data.

"The third paper [Economic Standards of Quality] will outline some of the fundamental ideas involved in the development of economic standards of quality. It will illustrate the application of statistical theory: (*a*) in the specification of the aimed-at quality characteristics so as to be of greatest usefulness from the viewpoint of design, production, and inspection; (*b*) in the establishment of efficient sampling procedures to attain adequate assurance that the quality specified is in fact being attained under the manufacturing conditions."

Dr. Shewhart also intends to visit Germany in order to discuss the problems in his special field with experts in that country. Arrangements for a meeting between Dr. Shewhart and the German experts have been made through the ASA office and the German national standardizing body.

Similar contacts have been made by ASA with the national standardizing bodies in the Scandinavian countries. It is possible that Dr. Shewhart will also have a conference at Stockholm with Swedish and possibly Norwegian and Danish experts.

British Standards for Illumination of Coal Mines

New standards for coal mine illumination in Great Britain were recently proposed by the Mines Department, which with the Safety in Mines Research Board is entrusted with the development, through research, of regulations for the preservation of the health and safety of the miners. The new standards provide for an increase of about 30 per cent in the candle power of both flame and electric safety lamps as compared with the requirements promulgated in 1912. The increased illumination proposed has been brought about by improvements in the flame safety lamps, by recent developments in electric safety lamps, and by new standards of the British Standards Institution for two-volt cells to be used with the electric safety lamps.

Recent research with electric safety lamps has shown that the proposed standard for illumination is greatly exceeded by both hand and cap lamps now available in Great Britain. Discussion of the proposed standard has focused the attention of the coal-mining industry upon the necessity of providing sufficient illumination in coal mines, which it is claimed even the new standard may not accomplish. This discussion has brought out certain points which are being given specific attention by both the Safety in Mines Research Board and the British collieries.

The special aims of the discussion are:

1. To determine and fix a higher lighting standard for new safety lamps (both flame and electric) that are submitted for approval, and to provide for the gradual displacement of the lamps of lower candle power now in use.

2. To require better maintenance practice in the colliery lamp rooms, together with minimum values of delivered candle power to serve as a measure of the useful life of a lamp.

3. To investigate the possibilities of extending the main lighting system of a mine to actual working faces where conditions of the individual mine will permit.

4. To recommend the use of white or light colored dust for rock dusting mine workings; to promote the practice now growing of whitewashing stations, pump rooms, haulageways, etc.

Grade-Marking of Lumber Required in Boston

Only grade-marked lumber above a certain minimum grade can now be used for structural purposes in Boston, Massachusetts, as the result of action taken by Building Commissioner Edward W. Roemer of the City of Boston. The ruling embodying the Commissioner's decision was issued on December 1, 1931, and became effective on April 1, 1932. It covers "all lumber (beams, boards, dimension, joists, plank, posts, etc.) used for load carrying purposes."

Stuart Huckins, of the George McQuesten Company, East Boston, reporting the new ruling in the March, 1932, issue of the *Purchasing Agent* says that it is the culmination of a series of conferences between the building commissioner and representatives of local retail lumber dealers. The object of the conferences was to standardize and safeguard the qualities and performance of lumber for structural use.

"The rulings of the commissioner," Mr. Huckins states, "will prove of benefit to the public, to contractors, architects, lumber dealers, owners of property, and to officials charged with the responsibility of maintaining proper standards in the construction industry. The public will gain in so far as the requirement of grade-marking will facilitate the administration of building code practice and procedure. It will benefit contractors and dealers in that their estimates will necessarily be predicated upon identical qualitative specifications in so far as structural lumber is concerned, for the reason that qualities and size must be shown on the plans for each building project.

"These grades and sizes, of course, cannot be less than the minimum requirements specified in the Commissioner's rulings of December 1, and through grade-marking their quality will be susceptible of accurate identification on the job. Moreover, these objective limitations of quality, clearly identified by expert graders, will protect the property owner against inferior quality and safeguard the integrity of his investment.

"It is probable that the progressive action of Mr. Roemer will be followed by other cities and towns of New England and thus become of sectional rather than of local importance. In any event, it is not unlikely that architects and builders recognizing the advantages of grade-marked lumber will require such identification for construction outside of Boston even though not required by law."

The work of grade-marking will be under the general supervision of the Boston Chapter of the Northeastern Retail Lumbermen's Association, a committee of which will cooperate with the Building Commissioner. A qualified supervisor of inspection already selected will instruct and examine retail yard inspectors. The latter will be licensed and the license numbers will appear on every piece of lumber inspected.

Committee Will Study Street Maintenance

An intensive study of street maintenance economics, which will include the formulation of standard methods for controlling street maintenance operations, for measuring the amount of work done and its cost, for preparing street maintenance work programs and budgets, and for accounting for expenditures, will be undertaken by the National Committee on Street Maintenance Economics, organized at the annual convention and road show of the American Road Builders' Association on January 14.

One of the first activities of the Committee will be to design a standard record and cost system to aid officials in determining when streets should be repaved. A few cities already keep such records for determining their street maintenance programs, and the Committee will endeavor to standardize these practices so that they may be applicable to a city of any size or form of government.

The work of the National Committee on Street Maintenance Economics is financed and staffed jointly by the American Road Builders'

Association and the Research Committee of the International City Managers' Association. George B. Sowers, Commissioner of Engineering and Construction of Cleveland, Ohio, and representative of the American Road Builders' Association on the Committee, is chairman. The organizations represented on the Committee are: International City Managers' Association; National Committee on Municipal Standards; American Society of Civil Engineers; American Society of Municipal Engineers; International Association of Public Works Officials; International Association of Comptrollers and Accounting Officers; American Municipal Association; Governmental Research Association.

Lead Industries Association Approves New Standard

The Lead Industries Association has recently approved a new standard for lead pipe which is being adopted by the principal manufacturers. Differences between the sizes of lead pipe of different manufacturers have been eliminated. In the new standard all sizes of lead pipe in the A, AA, and AAA (strong, extra strong, and double extra strong) will safely withstand constant cold water pressures of 50, 75, and 100 pounds per square inch, respectively. Heretofore, the safe working pressure for these classes of lead pipe has decreased as the diameter of the pipe has increased. Changes in sizes less than one inch in diameter are of minor importance, but a few such changes have been made to unify the product of the various manufacturers. The principal changes have been made in diameters between one and two inches, and in these sizes the pipe now has thicker walls and is stronger than is required by the majority of municipal building codes.

German Handbooks of Standards Available

Revised editions of three German handbooks containing reproductions of German standards covering specifications for ferrous and non-ferrous metals, standards for electrical machinery, transformers, and apparatus, and standards for electrical installation materials have just been received from abroad. The books were published by Deutscher Normenausschuss, the German national standardizing body, as part of a series of 18 handbooks designed to facilitate the use of the German national standards (DIN standards) by industry. The standard sheets published in the handbooks are reproduced to one-half the size of the originals.

Copies of the books may be borrowed or purchased through the office of the American Standards Association.

Specifications for Materials (Ferrous and Non-Ferrous Metals), DIN Taschenbuch 4, reproduces over 100 DIN sheets relating to steel and iron (including technical purchase specifications for forged and rolled steel, alloy steels, cast steel, cast iron, and malleable iron); rolled steel (including cross sections for tool steels; bar stock with circular, square, and hexagonal cross section; strip steel; sheet steel; steel pipe; etc.); drawn steel (including wire; round, square, hexagonal, and strip steel; steel shafting; key stock; pipe; etc.); non-ferrous metals (including nickel, babbitt, tin, solder, bronze, brass, and aluminum); semi-finished non-ferrous products (including sheets, strips, pipe, wire, etc.); and wire for the electrical industry (including overhead wires for electric railways, wire for machines and apparatus; wires for telegraph, telephone, and power lines). The price of the book is $1.80.

Electrical Standards for Machinery, Transformers, and Apparatus, DIN Taschenbuch 7, reproduces about 60 DIN sheets relating to transformers, direct current machinery, three-phase motors, polishing and grinding machinery, steel sheets for generators, copper wire for electric machine apparatus, and handles and hand wheels, etc., for switching apparatus. The price of the book is $1.20.

Electrical Installation Materials, DIN Taschenbuch 13, reproduces about 60 DIN sheets relating to basic standards (including current intensities for apparatus, screw threads for electric lamp bases and sockets and the gages for such threads, binding posts, etc.); component parts for power lights and wiring installations (including insulators, clamps, bushings, insulator supports, tubing, etc.); commutators, fuses, and plugs; lamp bases and sockets. The price of the book is 80 cents.

Further information about these books will be furnished by the ASA office upon request.

Abstracts of Articles on Engineering Available

Copies of the April, 1931, and July, 1931, issues of *Engineering Abstracts*, published quarterly by the Institution of Civil Engineers, in England, are available for loan through the ASA office to any one interested in examining them. The volumes contain a collection of abstracts of articles in engineering subjects originally published in periodicals outside the United Kingdom, the purpose of the volumes being to "indi-

cate the nature and scope of the more important information, published outside the United Kingdom, in the current literature of engineering and of applied science related thereto."

Railway, locomotive, road, automobile, aeronautical, mechanical, electrical, mining and metallurgical engineering, naval architecture, and marine engineering; harbors, docks, rivers, and canals; water supply; sewerage and sewage disposal; gas engineering; and building construction are the main subjects represented by the papers. Articles from American, Austrian, Belgian, Canadian, Dutch, French, German, Italian, Japanese, Norwegian, Spanish, Swedish, and Swiss periodicals are abstracted in English. The annual subscription rate is 1£ 10s.

Foreign Standards Available from ASA

The following are new foreign standards available to Sustaining-Members for loan or purchase through the ASA office. In requesting copies of the standards it is necessary to list only the ASA serial numbers preceding the titles. Send either a post-card or a note containing only the name and address of the person wishing to receive the standards and the numbers of the standards desired. The card or envelope should be addressed to the American Standards Association, 29 West 39th Street, New York.

ASA Serial Number

Czechoslovakia

133. Metric screw threads, series B, automotive industry
134. Metric screw threads, series C, automotive industry
135. Metric screw threads, series D, nominal diameter 35 to 90 mm, automotive industry
136. Metric screw threads, series D, nominal diameter 92 to 150 mm, automotive industry
137. Metric screw threads, series E, automotive industry
138. Metric screw threads, reference sheet, automotive industry

Germany

139. Circular sliver cans, textile machinery
140. Pickers for heavy box looms, textile machinery
141. Scientific periodicals, rules regarding their set-up, library practice
142. Short titles for periodicals, international rules for shortening the titles of periodicals
143. Shuttles, outside dimensions, textile machinery
144. Warper beams, textile machinery

Great Britain

145. Cast-iron spigot and socket soil, waste, ventilating, and heavy rainwater pipes
146. Conveyor troughing for use underground in mines
147. Mains supply apparatus for radio and acoustic reproduction for use on alternating-current mains
148. Sampling and analysis of coal for inland purposes
149. Test sieves
150. Varnished cloth sheet, strip or tape for electrical purposes
151. Wrought light aluminium alloy sheets and strip for general engineering purposes
152. Derrick cranes
153. Copper commutator bars

Federal Specifications on Food Available

The following Federal Specifications relating to foodstuffs have been published recently and copies are available through the ASA office:

Apples; canned
Applesauce; canned
Apricots; canned
Asparagus; canned
Barley; pearl
Beans; canned
Beets; canned
Butter
Cabbage; canned
Catsup; tomato
Cereals
Cheese; American
Cherries; canned
Chickens; dressed
Chocolate
Clams; fresh
Cocoa
Coconut; prepared
Coffee
Corn meal (white or yellow)
Cornstarch
Crabmeat; fresh
Cream; fresh
Dressing; salad
Eggs
Extracts, flavoring; and flavors, nonalcoholic
Fish; flaked, canned
Fish; fresh
Fish; salted or smoked
Flour; buckwheat
Flour; graham
Flour; wheat
Gelatin
Jams; fruit
Milk; dry, malted
Milk; dry, powdered, skimmed and whole
Milk; evaporated
Milk; fresh
Mincemeat
Mushrooms; canned
Nuts; assorted and mixed
Oatmeal; and rolled (or flaked) oats
Oil; olive
Oil; vegetable, salad
Oleomargarine
Olives
Onions
Oysters; fresh
Peaches; canned
Pears; canned
Pickles and relishes
Pineapples; canned
Potatoes; Irish
Potatoes; sweet
Powder; baking
Preserves; fruit
Prunes; canned
Raisins
Rice
Salmon; canned
Salt; table
Sardines; canned
Sauces; chili and worcestershire
Shrimp; canned
Soda; baking
Soups; canned
Spices
Sugar; beet or cane
Tea
Yeast

Standardization Proposed for Grading of Crushed Stone

As a result of an inquiry within the crushed stone industry by the National Crushed Stone Association, it has been found that more than 80 different sizes and shapes of screen openings have been used to produce crushed stone for various purposes. Differences between the sizes and grades produced are, in many cases, negligible. In some cases, variations larger than would be indicated by mere differences in screen size have been brought about in the plant due to such occurrences in plant operation as wearing of the screen plates, overloading of the screens, and changes due to the angles at which the screens are set. Moreover, the basis of measurement of size, whether by round hole or square mesh opening, varies with the plant, depending to some extent upon the preference of the buyer of the crushed product. Although an approximate equivalent of either the round hole or square mesh opening may be stated in terms of the other, it is evident that this ratio cannot be exact because crushed rock varies markedly in shape.

Consideration has been given for some time to proposals for a standard table covering sizes of mineral aggregates, whether crushed or not. Representatives of the National Slag Association, National Sand and Gravel Association, and Crushed Stone Association have recently prepared tables, according to an article by A. T. Goldbeck, director of the Bureau of Engineering, National Crushed Stone Association, in the October issue of the *Crushed Stone Journal*, and have tentatively agreed upon a classification of size gradations that cover most of the sizes that have many industrial uses. Twelve sizes have been proposed ranging down from $3^1/_2$ inches. It has been suggested that plants producing mineral aggregates need not attempt to prepare all of the proposed sizes but that any sizes made should be within the ranges given in the tentative classification.

In the preparation of this tentative classification, attention has been given specifically to the more important uses of mineral aggregates. In the article mentioned above, the discussion given covers aggregates for use in concrete of all types, macadam and bituminous concrete roads, railroad ballast, agricultural limestone, and filtering plants. It is not proposed in the tentative classification to cover fluxing nor use for metallurgical purposes of rock dust, as both of these materials are usually specified in accordance with the particular use to which they are to be put.

Issuance of the proposed standard at this time gives producers and consumers an opportunity to study the provisions and to determine whether changes are desirable. It is expected that producers and consumers will be brought together by the Division of Simplified Practice, Bureau of Standards, Department of Commerce to discuss the formulation of standard sizes that will be mutually satisfactory, according to Mr. Goldbeck. The proposals of the technologists of the three national mineral aggregates associations may well serve as a basis for discussions preliminary to such a conference.

Recent Activities of A.S.T.M. Committees

A.S.T.M. Committee D-7 on Timber, which promotes research and standardization work in this field, has recently announced that certain creosote tables will be presented to the Society at its annual meeting in June. These tables give data for correcting the volume and specific gravity of creosote, coal tar, and mixtures of creosote and coal tar. The work of this committee has been carried on in cooperation with representatives from similar committees of the American Railway Engineering Association and the American Wood Preservers Association.

Committee C-5 on Fire Tests of Materials and Construction has reported marked progress on fire tests for doors used on interior wall openings, and also fire tests for treated lumber. Consideration of comments and criticisms of Tentative Specifications for Fire Tests of Building Construction and Materials (A.S.T.M. C 19-26 T; also ASA A2-1926) is now under way in one of the subcommittees. It is hoped that the committee may shortly be able to propose these specifications to the American Society for Testing Materials for adoption as an A.S.T.M. standard.

A new standing committee, designated as Committee C-12, has recently been organized by the Society to undertake work in the field of mortars for unit masonry. The scope is given as follows:

> "Research to promote knowledge of properties and tests of mortars for unit masonry and development of methods of test and specifications for such mortars. . . ."

The temporary officers of this committee are: R. E. Davis, professor of civil engineering, University of California, Berkeley, California, *chairman;* J. C. Pearson, director of research, Lehigh Portland Cement Company, Allentown, Pennsylvania, *vice-chairman;* T. R. Lawson, professor of civil engineering, Rensselaer Polytechnic Institute, Troy, New York; C. L. Warwick, secretary, American Society for Testing Materials, Philadelphia, Pennsylvania, *secretary.*

A Review of Chemical, Textile, Wood, and Miscellaneous Projects

The seventh of a series of reviews of standardization projects under the procedure of the American Standards Association

The status of all projects concerning the chemical, textile, and wood industries, and those listed in the miscellaneous project section, with the exception of the safety codes in these groups which were reviewed in the November, 1931, issue of the ASA BULLETIN, which have been developed or are in the course of development under ASA procedure, is summarized in the following review. This review is the last in the series of project reviews which started in the November, 1931, issue of the ASA BULLETIN. The data presented are taken from the files of the American Standards Association and are corrected to April 1, 1932. The personnel of the sectional committees handling the projects may be found by reference to the project sections (K, L, O, and X, Z), pages 63–65 and 69–71, of the 1931 American Standards Association *Year Book*.

K3-1921[1]—Methods of Chemical Analysis of Manganese Bronze

Sponsor—American Society for Testing Materials.

K4-1921—Methods of Chemical Analysis of Gun Metal

Sponsor—American Society for Testing Materials.

The above standards, prepared by the sponsor, the American Society for Testing Materials, were submitted to ASA in 1921 and were approved as American Tentative Standards. The A.S.T.M. designations are B 27-19 and B 28-19.

K5-1922—Methods of Chemical Analysis of Alloys of Lead, Tin, Antimony and Copper

Sponsor—American Society for Testing Materials.

Scope—Methods applying particularly to white metal bearing alloys (known commercially as "Babbitt Metal") and to similar lead-base and tin-base alloys.

These laboratory methods, submitted to ASA by the A.S.T.M. as an existing standard, were approved as American Tentative Standard in 1922. The A.S.T.M. designation is B 18-21.

K8-1923—Method of Test for Flash Point of Volatile Flammable Liquids

Sponsor—American Society for Testing Materials.

The determination of the flash point of volatile flammable liquids is covered by this standard (A.S.T.M. D 56-21 and A.P.I. 509-29).

The ASA office was advised in October, 1931, that the sponsor, the A.S.T.M., in order to care for any future revisions, had assigned jurisdiction of this standard to the Sectional Committee on Petroleum Products and Lubricants (Z11).

K12-1921—Methods of Battery Assay of Copper

Sponsor—American Society for Testing Materials.

This standard method, adopted by the A.S.T.M. in 1920, and also approved by the American Chemical Society, was submitted to ASA and approved as American Tentative Standard in 1921. The A.S.T.M. designation is B 34-20.

K14-1930—Specifications for Liquid Soap

Sponsor—U. S. Department of Commerce, Bureau of Standards.

Scope—Specifications covering composition, sampling, and methods of analysis.

In 1930, ASA approved U. S. Government Specifications for Liquid Soap (Circular of the Bureau of Standards 124 and Federal Specification 27) as American Tentative Standard. In developing this standard, the Federal Specifications Board cooperated with the Soap Section of the American Specialty Manufacturers

[1] Standard methods in the K Group (Chemical Industry) are widely used as a basis for analyses by producing, consuming, and independent agencies in the particular fields to which they refer.

Association and the resulting document was forwarded to all known American manufacturers of liquid soap, 110 of whom had expressed to the Bureau of Standards their willingness to supply soap guaranteed to comply with the provisions of the specifications.

Although mention was made at the time of its approval of possible technical changes that would make the standard more satisfactory, a canvass of the manufacturers by the Bureau of Standards in 1931 showed a preponderance of influence against any revision. Prior to the above canvass, the Federal Specification 27 was reprinted by the Federal Standard Stock Catalog Board and is now known as Federal Specification for Liquid Toilet Soap, designated as P-S-618, dated October 14, 1930. In this reprinted form certain minor changes have been made in some of the chemical tests in addition to changes of wording that are editorial in character. The ASA office is at present engaged upon a canvass of prominent consuming and producing groups to determine the acceptability of the Federal Specification for Liquid Toilet Soap (P-S-618) as an American Standard.

K15-1930—Methods of Routine Analysis of White Pigments

Sponsor—American Society for Testing Materials.

K16-1930—Methods of Routine Analysis of Dry Red Lead

Sponsor—American Society for Testing Materials.

Submitted by the American Society for Testing Materials under the proprietary method, these standards, covering the laboratory analyses of certain pigments, were approved as American Standards in 1929 and revised in 1930. The A.S.T.M. designations are D 34-30 and D 49-29.

K18-1930—Methods of Laboratory Sampling and Analysis of Coal and Coke

Sponsor—American Society for Testing Materials.

In 1929, under the proprietary method, the A.S.T.M. submitted these standard methods of laboratory sampling and analysis of coal and coke to ASA. This standard was approved as American Standard in the same year and proprietary sponsorship for the project was granted to the A.S.T.M. Minor revisions to keep the standard current with technical advances were proposed and approved in 1930. The present American Society for Testing Materials designation is D 271-30.

At present, A.S.T.M. Committee D-5 which maintains supervision over this standard, is considering a tentative revision which will permit, as an optional provision, the use of a small ball mill for grinding samples.

K19—Specifications for Fuel Oils

Sponsor—American Society for Testing Materials.

Chairman—Lee P. Schneitter, Electric Bond & Share Company, New York.

Secretary—A. E. Flowers, DeLaval Separator Company, Poughkeepsie, N. Y.

Scope—The preparation of specifications for fuel oil, including domestic, industrial, and Diesel fuels, and excluding oils with a flash point below approximately 100 F Tag., closed cup, oils burned in wick burners, and oil for gas-making purposes.

A request for the standardization of Diesel fuel oils was received by ASA in May, 1929, from the American Society of Mechanical Engineers. Subsequent canvass indicated that several organizations were interested in the proposed project and that A.S.T.M. Committee D-2, the Federal Specifications Board, and the Division of Trade Standards of the Bureau of Standards had made considerable progress in developing certain specifications in this field. The work of the latter organization resulted in the development of CS 12-29, Domestic and Industrial Fuel Oils. In view of this general interest and activity in the subject, it appeared desirable to undertake the development of specifications for all the types of oils shown in the above scope when used as fuels. Accordingly, at its meeting on December 18, 1929, the ASA Standards Council sanctioned the proposal and authorized development of the project under the sectional committee method with the American Society for Testing Materials as sponsor, in accordance with its request for such sponsorship.

In organizing the work of the committee, two sections have been set up—Section I on Domestic and Industrial Fuel Oil with L. P. Smith, U. S. Navy Yard, Philadelphia, as chairman, and Section II on Diesel Fuel Oils with L. H. Morrison, associate editor, *Power*, McGraw-Hill Publishing Company, New York, as chairman. The section on Diesel fuel oils has been further divided into three subcommittees:

(*a*). Subcommittee to study combustion and spray research from a theoretical and laboratory angle under the chairmanship of W. F. Joachim, Westinghouse Electric and Manufacturing Company, Philadelphia.

(*b*). Subcommittee to study the physical and chemical properties of Diesel fuels within the Diesel range in the laboratories of the

oil companies under the chairmanship of Dr. Raymond Haskell, industrial engineer, Texas Company, New York.

(*c*). Subcommittee to perform field tests in the shops of the various manufacturers of oils as specified by the physical and chemical subcommittee under the chairmanship of M. J. Reed, research engineer, Diesel Engine Manufacturers Association, New York.

The combustion and spray research subcommittee has presented a report giving a survey of the literature pertaining to spontaneous ignition and ignition lag. This subcommittee is cooperating with the Fuels Committee of the Society of Automotive Engineers in a study of the effect of various fuels in relation to spray combustion and other phases of oil performance, especially in high speed Diesel engines.

The subcommittee for chemical and physical research has been studying various oils which have not given satisfactory service in the field, even though their physical properties seem to indicate that they would be suitable as Diesel fuel.

The field test subcommittee drew up an appropriate test to study the effect of viscosity and Conradson carbon on Diesel engine operation. With the work of this subcommittee, Fairbanks Morse & Company have been cooperating, and they have prepared a report giving data derived from some very complete tests.

L3-1931—Specifications for Cotton, Rubber-Lined Fire Hose for Public and Private Fire Department Use

Sponsor—American Society for Testing Materials; Fire Protection Group.

Chairman—P. L. Wormeley, Bureau of Standards, Washington, D. C.

Secretary—C. J. Krieger, Underwriters' Laboratories, New York.

Scope—Construction and performance under tests of rubber-lined fire hose for use by private and public fire departments.

These specifications were originally submitted to ASA in 1925 under the sponsorship of the American Society for Testing Materials and the Fire Protection Group, and were approved as American Tentative Standard by the American Standards Association in 1929.

As technical advances in the methods of rubber manufacture now permit an organic acetone extract of a maximum of four per cent, a revision to maintain the standard in accord with current practice was approved as American Tentative Standard in March, 1931. The American Society for Testing Materials designation is D 296-31 T.

L4—Specifications and Standards for Sheets and Sheeting

Autonomous Sectional Committee

Scope—Specifications and standards for sheets and sheeting, including some effective means of presenting data useful to the ultimate consumer in the purchase of sheets, and including such physical characteristics and properties as thread count, weight, breaking strength, loading; other factors which may determine appearance, feel, durability, and resistance to laundering; standardization of sizes and coordination with the simplification work of the Division of Simplified Practice in this field; a system of grades for sheets; and methods of inspection and test.

As a result of a formal request of the American Home Economics Association for the initiation of a project on specifications and standards for sheets and sheeting, a general conference was held in 1928 under the auspices of the American Standards Association, and was attended by 54 representatives of 36 organizations. Following unanimous recommendation that ASA proceed with the work, a representative technical committee was organized.

A draft standard, prepared by a subcommittee, includes maximum weights for light, medium, and heavy weight sheets and sheeting; the maximum amount of finishing materials to be allowed, and methods of testing their presence; also the provision that this information should be specified on a label, which should further show tensile strength of warp and filling, tolerance limits, and thread count.

Work is being held in abeyance pending recommendations from the Cotton Textile Institute, on behalf of which it has been indicated that although its members are not in a position to accept the recommendations in the draft standard, they do not wish to take the responsibility for the abandonment of the project.

L5-1931—General Methods of Testing Woven Textile Fabrics

Sponsor—American Society for Testing Materials.

Scope—General methods of testing woven textile fabrics, exclusive of materials requiring special treatment (for which specific methods of test will be described applicable for that material and such special methods shall take precedence over the general methods) and exclusive of cord fabrics used in manufacturing tires.

Embracing methods of testing generally recognized as acceptable for practically all types of textile materials ranging from airplane fabrics to dress materials and household linens (exclusive of cord fabrics used in manufacturing tires), this standard was developed from earlier methods of test for cotton yarns and fabrics which had been approved as American Tentative Standard in 1923. The more inclusive docu-

ment (A.S.T.M. D 39-27) was approved as American Standard in 1931. At present, A.S.T.M. Committee D-13 on Textile Materials is considering an addition to the test to cover tear resistance of fabrics. This additional section has been published as a tentative revision.

L6—Specifications for Blankets

Scope—Standardization of sizes, and tolerances thereon, for all-wool, part-wool, and cotton blankets (having due consideration for the work of the Department of Commerce); minimum limits for tensile strength; a system of standard weights; and physical and thermal properties, as a basis for performance specifications.

Work on the preparation of specifications for blankets was started by ASA in 1929 at the request of the American Home Economics Association, but has been in abeyance for some time. It will probably remain in abeyance pending the accumulation of experience with the Recommended Commercial Standard for Wool and Part-Wool Blankets, completed in March, 1932, which it is proposed to submit for ASA approval following a period of trial and necessary revisions.

O3-1926—Specifications for Cross-Ties and Switch-Ties

Sponsors—American Railway Engineering Association; U. S. Department of Agriculture, Forest Service.

Chairman—John Foley Forester, Pennsylvania System, Philadelphia.

Secretary—Arthur T. Upson, consulting engineer, National Lumber Manufacturers Association, Washington, D. C.

Scope—The unification of specifications for wood cross-ties and switch-ties for all classes of use, including mine ties; grouping with regard to preservative treatment, but not including methods of treatment and unification of inspection rules.

As a result of a request in 1921 from the U. S. Department of Agriculture, Forest Service, and the American Railway Engineering Association, it was decided to organize a sectional committee to develop specifications for cross-ties and switch-ties. Organized in 1922, the committee considered several drafts before the final document was submitted to ASA. This was approved as American Standard in 1926. The Manufacturers Standardization Committee of the National Lumber Manufacturers Association and the National Hardwood Association have adopted the American Standard for their organizations, and the latter association has published the provisions of this standard applicable to hardwood in its *Handbook*. This standard, according to the Committee on Ties of the Engineering Division of the A.R.A., represents the best current practice and is acceptable to tie producers, resulting in mutual benefits to both producing and consuming interests.

O4—Methods of Testing Wood

Sponsors—American Society for Testing Materials; U. S. Department of Agriculture, Forest Service.

Chairman—L. J. Markwardt, Section of Timber Mechanics, Forest Products Laboratory, Madison, Wis.

Secretary—M. O. Withey, professor of mechanics, University of Wisconsin, Madison, Wis.

Scope—Methods of physical, including mechanical, testing of wood as a material in structural form, or as standard specimens, but not including methods of testing articles manufactured from wood.

Subsequent to a request for the development of standards in this field received in 1921 from the American Society for Testing Materials and the U. S. Department of Agriculture, Forest Service, tentative drafts of methods of testing wood received wide attention for several years from laboratories connected with the universities, and also from the timber industry. Modifications of the provisions of these methods were made from time to time in accordance with comments and criticisms received.

In 1927, Methods of Testing Small Clear Specimens of Timber and Methods of Conducting Static Tests of Timbers in Structural Sizes were adopted by the A.S.T.M. with the designations of D 143-27 and D 198-27, respectively. They were approved in the same year as American Standard with ASA designations of O4a-1927 and O4b-1927, respectively.

O5—Specifications for Wood Poles

Scope—Standardization of dimensional classifications, defect descriptions and limitations, manufacturing practices and inspection rules for eastern cedar, western cedar, chestnut, and southern pine poles, lodgepole pine and Douglas fir poles; also standardization of fibre strengths for these species in pole sizes.

Chairman—R. H. Colley, Bell Telephone Laboratories, New York.

Secretary—A. B. Campbell, National Electric Light Association, New York.

In 1922, an association interested in wood poles from the consumer's standpoint submitted to the American Standards Association, for adoption as an American Standard, its specifications for wood poles. Objections to these specifications were raised on the ground that they did not embody the points of view of all interested in the subject.

This resulted in the appointment of a sectional

committee to prepare specifications consistent with modern conditions. This sectional committee was organized under the leadership of the Telephone Group, consisting of the Bell Telephone System and the U. S. Independent Telephone Association.

After several years' work, Specifications for Ultimate Fibre Stresses of Wood Poles, and Specifications and Uniform Dimension Tables for Northern White Cedar Poles, Western Red Cedar Poles, Chestnut Poles, and Southern Pine Poles were prepared. The standard for Ultimate Fibre Stresses of Wood Poles was approved in December, 1930, and the Specifications and Dimension Tables were approved on June 20, 1931. The sectional committee is now preparing specifications and dimension tables for lodgepole pine and Douglas fir poles for submittal to ASA.

The specifications and dimension tables for the wood poles have been published as four pamphlets, each pamphlet containing the standards for one species of wood. These pamphlets are available at 20 cents each.

X1-1921—Method for Sampling of Coal

Sponsor—American Society for Testing Materials.

Submitted as an existing standard by the A.S.T.M., Method for Sampling of Coal (A.S.T.M. D 21-16) was approved as American Tentative Standard in 1921. Later, the A.S.T.M. was appointed sole sponsor for this project. The method indicated in this standard applies principally to the testing of large samples of coal, that is, carload or shipload quantities, and should not be confused with the method employed in the laboratory sampling and analysis of coal which is covered by the American Standard K18-1930.

In the preparation of this standard method the Bureau of Mines took an active part and has brought the method into general use in its own work and recommended it for use wherever coal deliveries are sampled. The Bureau has found that the specifications meet the need of the industry.

At a meeting in March of A.S.T.M. Committee D-5 which has jurisdiction over this standard, consideration was given to a proposed tentative method for sampling coke for analysis. As certain provisions of this proposed tentative standard for sampling coke are identical with similar sections in X1-1921, there is a possibility of a revision of the latter document at some future date to include methods for sampling large lots of coke.

Z7-1925—Illuminating Engineering Nomenclature and Photometric Standards

Sponsor—Illuminating Engineering Society.

Chairman—E. C. Crittenden, chief, Electrical Division, Bureau of Standards, Washington, D. C.

Secretary—Howard Lyon, Welsbach Company, Gloucester, N. J.

Scope—The definition of terms used in illuminating engineering and photometry, together with the formulation of general principles to govern the measurement of light and illumination and the application of such measurements in practice.

This standard was submitted by the Illuminating Engineering Society to ASA and approved in 1925 as an American Standard, the Society being appointed sole sponsor. In 1928 the sponsor announced its intention to revise the standard, requesting that the standard when revised be considered as its proprietary standard. This request was granted by ASA. The proposed standard in revised form was published for criticism and comment in the *Transactions of the Illuminating Engineering Society* of October 8, 1930. The revision is still in course of progress.

Z10—Scientific and Engineering Symbols and Abbreviations

Scope—A broad program of unification of graphical symbols and symbols for quantities in equations and formulas, and of abbreviations, as used in engineering and scientific reports, tables, publications, etc.; but not including definitions of terms used in engineering and scientific practice.

Chairman—J. F. Meyer, Bureau of Standards, Washington, D. C.

Secretary—Preston S. Millar, Electrical Testing Laboratories, New York.

The great confusion existing in text-books and technical journals of the various industries and professions because of the wide variation in the symbols and abbreviations used has long been a source of misunderstanding and continued discussion among scientific and engineering groups throughout the English-speaking world. The unification of these symbols and abbreviations was particularly desired by research workers, designing engineers, and many others in order that the formulas which were widely used might be readily understood and applied more quickly and with fewer errors. A formal request for the unification of such practices was made of the American Standards Association in 1922 by the American Institute of Electrical Engineers and the Association of Edison Illuminating Companies. Five leading technical societies accepted joint sponsorship for the sectional committee which they organized in January, 1926.

Development of these projects has proceeded

slowly because of the magnitude of the work, but the following reports have been adopted as American Standard or American Tentative Standard:

Symbols for Hydraulics (Z10b-1929)
Symbols for Photometry and Illumination (Z10d-1930)
Aeronautical Symbols (Z10e-1930)
Mathematical Symbols (Z10f-1928)
Navigational and Topographical Symbols (Z10h-1930)
Letter Symbols for Electrical Quantities (Z10g1-1929)
Graphical Symbols for Telephone and Telegraph Use (Z10g6-1929)
Symbols for Heat and Thermodynamics (Z10e-1931)
Symbols for Mechanics, Structural Engineering, and Testing Materials (Z10a-1932)

The last-mentioned standard was approved in February, 1932, as American Standard. It consists of letter symbols for 69 quantities commonly used in the mechanical and structural engineering and testing material fields.

Z11—Methods of Testing Petroleum Products and Lubricants

Sponsor—American Society for Testing Materials.

Chairman—T. A. Boyd, Research Laboratory, General Motors Corporation, Detroit, Mich.

Secretary—R. P. Anderson, American Petroleum Institute, New York.

Scope—Methods of test of petroleum and all products derived therefrom, except tests applied to such products used as road or paving materials or for waterproofing; methods of test of lubricants, including all materials used for lubrication when they consist either wholly or in part of petroleum products. The scope of this project excludes tests applied to organic chemicals or to products used medicinally.

In October, 1922, the American Society for Testing Materials called attention to the need for nationally recognized standard methods for testing petroleum products and lubricants and requested that the project be formally undertaken under the procedure of the American Standards Association.

The initiation of this project was approved by ASA in March, 1923. In organizing the committee the sponsor took as a basis its own Committee D-2, the scope of which had been broadened in 1920 to include the entire field of developing standard methods of testing petroleum products and lubricants.

During the past four years, 23 methods of test have been recommended by this committee and have been approved either as American Standard or as American Tentative Standard. These standards are listed below:

Z11a-1928—Standard Abridged Volume Correction Table for Petroleum Oils (A.S.T.M. D 206-25) (A.P.I. 500-29)

Z11b-1930—Methods of Test for Viscosity of Petroleum Products and Lubricants (A.S.T.M. D 88-30) (A.P.I. 518-30)

Z11c-1928—Method of Test for Penetration of Greases and Petrolatum (A.S.T.M. D 217-27T)

Z11d-1928—Method of Test for Melting Point of Paraffin Wax (A.S.T.M. D 87-22) (A.P.I. 513-29)

Z11e-1930—Method of Test for Cloud and Pour Points of Petroleum Products (A.S.T.M. D 97-30) (A.P.I. 506-30)

Z11f-1928—Method of Test for Flash and Fire Points by Means of Open Cup (A.S.T.M. D 92-24) (A.P.I. 511-29)

Z11g-1928—Method of Test for Flash Point by Means of the Pensky-Martens Closed Tester (A.S.T.M. D 93-22) (A.P.I. 510-29)

Z11h-1930—Method of Test for Water and Sediment in Petroleum Products, by Means of Centrifuge (A.S.T.M. D 96-30) (A.P.I. 520-30)

Z11i-1930—Method of Test for Water in Petroleum Products and Other Bituminous Materials (A.S.T.M. D 95-30) (A.P.I. 519-30)

Z11j-1930—Method of Test for Distillation of Gasoline, Naphtha, Kerosene and Similar Petroleum Products (A.S.T.M. D 86-30) (A.P.I. 507-30)

Z11k-1930—Method of Test for Distillation of Natural Gas Gasoline (A.S.T.M. D 216-30) (A.P.I. 508-30)

Z11l-1928—Method of Test for Neutralization Number of Petroleum Products and Lubricants (A.S.T.M. D 188-27T)

Z11m-1928—Method of Test for Sulfur in Petroleum Oils Heavier than Illuminating Oil (A.S.T.M. D 129-27) (A.P.I. 516-29)

Z11n-1928—Method of Test for Thermal Value of Fuel Oil (A.S.T.M. D 240-27) (A.P.I. 517-29)

Z11o-1928—Method of Test for Steam Emulsion of Lubricating Oils (A.S.T.M. D 157-28) (A.P.I. 515-29)

Z11p-1928—Method of Analysis of Grease (A.S.T.M. D 128-27) (A.P.I. 501-29)

Z11q-1930—Method of Test for Burning Quality of Kerosene Oils (A.S.T.M. D 187-30) (A.P.I. 502-30)

Z11r-1930—Method of Test for Burning Quality of Mineral Seal Oil (A.S.T.M. D 239-30) (A.P.I. 504-30)

Z11s-1930—Method of Test for Burning Quality of Long-Time Burning Oil for Railway Use (A.S.T.M. D 219-30) (A.P.I. 503-30)

Z11t-1930—Method of Test for Saponification Number (A.S.T.M. D 94-28) (A.P.I. 514-29)

Z11u-1930—Method of Test for Detection of Free Sulfur and Corrosive Sulfur Compounds in Gasoline (A.S.T.M. D 130-30) (A.P.I. 521-30)

Z11v-1930—Method of Test for Melting Point of Petrolatum (A.S.T.M. D 127-30) (A.P.I. 523-30)

Z11w-1930—Method of Test for the Determination of Autogenous Ignition Temperatures (A.S.T.M. D 286-30) (A.P.I. 522-30)

A recent development in the activities of this sectional committee concerns the set-up of machinery for the interchange of developments in petroleum standardization with foreign countries. The International Standards Association, of which body ASA is a member, decided in 1930 to set up a committee to discuss the possibility of unification between national standards for Nomenclature and Methods of Test of Petroleum Products (ISA Committee 28). The secretariat of this committee was assigned to ASA due to the expressed desire of American groups to be closely connected with this work through the sectional committee and the sponsor, the A.S.T.M. In November, 1931, and again in March, 1932, invitations to participate in the international work were sent to member-bodies of the ISA and also to the national standardizing bodies of Great Britain, Canada, and Australia. In the first letter sent to the foreign bodies an outline of the procedure employed in the United States to develop American Standards in this field was discussed and an invitation was extended to the foreign bodies to prepare similar statements covering the procedure employed in their several countries. To facilitate the exchange of information, Dr. R. P. Anderson, secretary of Sectional Committee Z11, A.S.T.M. Committee D-2, and also of the Division of Refining of the American Petroleum Institute, has been appointed by ASA as the American representative on the ISA technical committee.

Z14—Standards for Drawings and Drafting Room Practice (Exclusive of Architectural Drawings)

Sponsors—American Society of Mechanical Engineers; Society for the Promotion of Engineering Education.

Chairman—Franklin DeR. Furman, Stevens Institue of Technology, Hoboken, N. J.

Secretary—Carl W. Keuffel, Hoboken, N. J.

Scope—Classification of and corresponding nomenclature of drawings in accordance with their purpose, method of representation of the subject, including arrangement of views and sections, use of lines of different kinds and thickness, indication of dimensions, tolerances, and fits, tapers and slopes, and surface or finish, symbols for elements, indication of materials by cross-hatching, arrangement of borderline, title, part list, notes, changes, and revisions, method of folding and punching, kinds and sizes of lettering, figures, and symbols, scales of reduction and enlargement, sizes of drawings and filing cabinets, width of rolls of paper and cloth, size of drafting equipment and tools, specifications of materials to be used for drawings and drafting, exclusive of architectural drawings.

Drafts of proposed standards on specifications for paper and cloth, method of indicating dimensions, lettering, layout of drawings, line work, and graphical symbols on drawings have been worked out and are now under consideration by the editing committee made up of the chairmen of the six subcommittees concerned. It is expected that in so far as these drafts have been published for criticism they will shortly be in shape for submission to the entire sectional committee. It is also possible that certain items will call for further publication in order to obtain general criticism and comment.

Z15—Standards for Graphic Presentation

Sponsor—American Society of Mechanical Engineers.

Chairman—E. F. DuBrul, National Machine Tool Builders Association, Cincinnati, Ohio.

Secretary—George E. Hagemann, Alexander Hamilton Institute, New York.

Scope—Includes standard methods for the graphic presentation of business and other data.

Subcommittee 4 on Engineering and Scientific Graphs held an open meeting in December, 1931, where a paper was presented on Charts for Lantern Slides, prepared by a special subgroup in order to meet the demand for the use of better lantern slides in the presentation of technical papers. This pamphlet is now under revision.

Z17-1927—Table of Preferred Numbers

Scope—Development of a system of numbers in geometric series for use in size standardization.

The American Standards Association has sent out invitations to a number of organizations to appoint representatives on the new sectional committee, which is to review the recommendation made in 1927 to American industry by a special committee appointed under ASA procedure. The organization of the new sectional committee has been practically completed.

Z18—Standardization of Speeds of Machinery

Sponsor—American Society of Mechanical Engineers.

Chairman—Allan E. Hall, Allis Chalmers Manufacturing Company, Milwaukee, Wis.

Secretary—W. S. Hays, executive secretary, Power Transmission Society, Philadelphia, Pa.

Scope—Standardization of the speeds of machinery and of such elements for mechanical power transmission as are functions of said speeds.

A proposed series of standard speeds (rpm) for driving units and driven shafts of machines was completed, and distributed in March, 1931, to approximately 400 manufacturers and users of various types of machinery. One hundred sixty one replies were received, and a digest of the results was discussed at meetings of the subcommittee on questionnaire and canvass to industry held in October and December, 1931. It was decided that a revised proposal of standard speeds would be prepared and sent out.

Z21—Approval and Installation Requirements for Gas Burning Appliances

Sponsor—American Gas Association.

Chairman—R. B. Harper, chief chemist, People's Gas Light & Coke Company, Chicago, Ill.

Secretary—R. M. Conner, American Gas Company, Testing Laboratory, Cleveland, Ohio.

Scope—Establishment of minimum or basic requirements for the installation, performance, safe operation, and substantial and durable construction for gas burning appliances; together with such laboratory methods of test as are necessary for determining compliance therewith.

In 1930 the committee of the American Gas Association in charge of the development of approval requirements for gas appliances was broadened to include 24 representatives of 13 organizations, and was formally approved as a technical committee of the American Standards Association, with the American Gas Association as official sponsor.

The approval requirements under development are technical specifications for the testing for approval purposes of appliances covering a wide range of service. They aim, in the first place, to assure safety, but also to provide for a reasonable degree of durability inseparable from safety, and reasonable operating efficiency.

The Approval Requirements for Gas Ranges, the first of the series to be completed, were formally approved as American Recommended Practice in February, 1932.

Approval and listing requirements in course of preparation or of revision at the present time are as follows:

Central heating gas appliances
Clothes dryers
Draft hoods
Flexible gas tubing
Garage heaters
Gas cocks
Gas heated ironers
Gas, pressure, and temperature control accessories
Gas refrigerators
Gas water heaters
Hotel and restaurant ranges
Hot plates and laundry stoves
House piping and appliance installation
Incinerators
Industrial gas boilers
Installation of conversion burners in house and water heating appliances
Space heaters

Z23—Specifications for Sieves for Testing Purposes

Sponsors—American Society for Testing Materials; U. S. Department of Commerce, Bureau of Standards.

Chairman—L. T. Work, Columbia University, New York.

Secretary—L. V. Judson, Bureau of Standards, Washington, D. C.

Standardization of sieves for testing purposes, a subject of special moment to technologists engaged upon size determinations, was proposed to ASA by the A.S.T.M. and the Bureau of Standards in December, 1930. Development of standards in this field had been under consideration by the Bureau of Standards for some years, and a U. S. Standard Sieve Scale had been adopted in 1920 which, with slight changes in methods of designation, was adopted by the A.S.T.M. in 1926. In the several years since its first adoption, the use of the U. S. Standard Sieve Scale has been greatly extended, not only in the United States but also in foreign countries. Discussions of sieve testing have been made the subject of ISA Committee 24 with the secretariat in the hands of the Polish national standardizing body. Tentative proposals for testing sieves circulated through the ISA in 1930 indicated that important differences existed between these proposed standards and the views of American technologists. For this reason, and also to unify American technical practice, the A.S.T.M. and the National Bureau of Standards deemed a sectional committee necessary to harmonize specifications for sieves for testing purposes in the United States as a preliminary to discussions in the international field. Their request was favorably acted upon by Standards Council in September, 1931.

The sectional committee, organized in the fall of 1931, held its first meeting on December 15, 1931, in Philadelphia, the headquarters of

the Society. A full discussion of the technical points indicated that the work of the committee should be subdivided, and the following five subcommittees were authorized:

1. Coarse sieves (square mesh and round holes, if both are found necessary)
2. Fine sieves
3. Pigments or other materials requiring special attention
4. The presentation of data
5. The calibration of sieves

The scope recommended by the sectional committee is as follows:

> Specifications for sieves (screens) for testing purposes including nominal dimensions, tolerances, designation, and methods of verification; also methods for reporting results of sieving.

As permanent officers, the committee elected the following: L. T. Work, assistant professor of chemical engineering, Columbia University, New York, *chairman;* F. H. Jackson, Bureau of Public Roads, Washington, D. C., *vice-chairman;* and L. V. Judson, Bureau of Standards, Washington, D. C., *secretary*.

The committee also decided to participate in the work of ISA Committee 24 on Unification of Sieves for Testing Purposes, and recommended that Dr. L. V. Judson be designated as the American representative.

Z24—Noise Measurement

Sponsor—Acoustical Society of America.

Chairman—V. O. Knudsen, University of California, Los Angeles, Calif.

Secretary—J. W. McNair, electrical engineer, American Standards Association, New York.

Scope (*tentative*)—Preparation of general standards of nomenclature, units, scales, in the field of acoustics, with special reference to noise measurement.

In accordance with a request made on behalf of the Acoustical Society of America for the initiation of a project to unify the standardization of work being done on units and scales for the measurement of noise, together with the standardization of units and scales for the measurement of sound absorption and sound transmission, a conference was held in January, 1932, to decide whether the project should be undertaken. In the general conference, attended by 32 representatives of 18 national bodies, the vote was unanimous in favor of the initiation of the work under the sponsorship of the Acoustical Society of America. The sectional committee has been organized, and its first meeting was held on May 4, 1932, at which time the subcommittees on nomenclature and noise measurement made preliminary reports.

ASA Approves Standard for Transformers

Recommended Practice for Temperature Operation of Transformers (C53), submitted to ASA by the American Institute of Electrical Engineers as an existing standard, has been approved by the American Standards Association as American Recommended Practice.

These recommendations were developed by a subcommittee under the auspices of the Standards Committee of the American Institute of Electrical Engineers (A.I.E.E. Pamphlet No. 100) and were approved by the Board of Directors of the A.I.E.E. on January 25, 1930. They are the direct result of a demand on the part of users of large expensive apparatus and recognize the economic importance of obtaining, in service, outputs greater than the test rating defined in the existing A.I.E.E. transformer standards. It is felt that these recommendations will serve as a valuable guide in the operation of transformers when operating conditions vary from those specified in the standard acceptance tests.

In addition, the difference in maintaining temperatures continuously at the maximum value by means of allowing overloads, and of reaching that temperature occasionally under usual service conditions where the test rating is never exceeded, is recognized and there is established for the first time a temperature differential of 10 C in the recommended maximum temperatures for the two kinds of service. Copies of the pamphlet may be obtained at a cost of 20 cents each.

Approval Requirements for Gas Ranges

The American Standards Association has approved as American Recommended Practice the Approval Requirements for Gas Ranges (Z21a-1932).

This recommended practice is the first to be approved by ASA of a series of specifications now in process of development under the procedure of the American Standards Association with the American Gas Association as sponsor. The series is being developed for the purpose of providing authoritative recommendations for the testing of gas-burning appliances.

A detailed statement concerning the new standard will be published in June.